The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. XXXIV. January 4, 1936 No. 862

Chemists and Fuel Research

POWER, heat and light are essentials to most, and in some measure to almost every industry, and in many instances the cost of fuel in one form or another plays an important part in the economics of manufacturing processes. The subject of fuel has, however, gone farther than this, for coal is now achieving its rightful place as the raw material of industry, and in no instance is that movement more advanced than in the chemical industry. The carbonisation of coal in coke ovens, in gasworks, and in low temperature retorts, provides a sequence of raw materials of surprising range. The number of industries based upon coal tar, its derivatives and synthetic products of kindred nature is many. It will not be the fault of Professor G. T. Morgan and his colleagues if low temperature tar is not a similar happy hunting ground to high temperature tar. Hydrogenation of coal is already an established branch of the chemical industry.

It is shown in the report of the Fuel Research Board that the total energy derived from coal in this country and usefully applied is greater to-day than it was in 1910, twenty-five years ago, yet the amount of coal used has decreased by some 20 millions of tons. There is only one reason for this striking result—the application of science to fuel utilisation, the growth of technical art known as " fuel technology." As the Fuel Research Board justly remarks " the gain in efficiency has an important bearing on the cost of living and the cost of production of manufactured articles." It is very evident from the difficulties of the mining industry and the unrest in the coal-fields that the increased efficiency of fuel utilisation has had a detrimental effect upon the coal mines and those who work in them. It may be asked whether the time has not come when price increases will have to be made to off-set the gain in fuel efficiency. It seems to be a retrograde step, but on the other hand the nation can better afford to pay a little more for its fuel than to have never-ending discontent in the coal-fields puntuated with yet more disastrous strikes. The paralysing effect of a prolonged coal strike does not disappear with the cessation of the strike. The most important trade of all, the export market, is handicapped for years because the foreigner will not buy from a country in which conditions are so unsettled that no reliance can be placed upon dates of deliveries. Unquestionably there are large coal-using industries, such as the generation of electrical power in the power plants of electrical undertakings, in which a considerable increase in the price of coal would scarcely affect the selling price of the finished commodity to the consumer. On the other hand there are industries, such as the manufacture of pig-iron, where the cost of coal is the major single cost. The solution of the difficulty would seem to be a national coal and fuel policy, in which the price of coal was governed not by the best market price the producer can get or at which the consumer can purchase, but by the capacity of each manufacturing process to pay.

Meanwhile the Fuel Research Board must clearly pursue its work of conserving our coal resources and of increasing the applications of science to coal and fuel generally. Probably it is unnecessary for further work to be carried out upon the hydrogenation of coal because the progress made at Billingham and by the constituent companies of International Hydrogenation Patents, Ltd., has gone some considerable way beyond anything the Board with its much smaller facilities can hope to achieve. The future development of the process can be left in the hands of the chemical industry. The manufacture of lubricating oils from coal is still unsolved, however, and there seems to be some disposition to believe that the best method of starting the synthesis is to convert the coal into coke, the coke into $CO + H_2$ and to proceed by a series of yet uncharted or undiscovered chemical reactions. The Fischer process for the production of light hydrocarbons uses this gaseous mixture as the starting point, and so also does the process now used for the synthesis of methyl alcohol. Has not the time come for the Fuel Research Board to devote those energies that have been so worthily expended upon the hydrogenation of coal to a consideration of the several products that by proper catalysts and the selection of pressure and temperature can be made from coke via the water-gas reaction?

The advances in the science of coal-cleaning have had one important effect; the large coal is now no more valuable, and possibly rather less valuable, than the smaller coal. Clearly a complete revaluation of the various sizes of coal is indicated and there seems little or no reason why coal should not be sold upon analysis, the size being selected to suit the process or apparatus for which it is used. The pricing of coal according to size is an illogicality that will surely disappear before the march of science. With the inception of national coal marketing arrangements, this new fact may be given practical application; but if the coal trade is not sufficiently awake to realise it, no doubt the users of coal will do so, and will take it into full account when making their purchases. Already collieries are breaking their coal to correspond with the sizes demanded by purchasers. The Board's report is full of significant facts for those who have eyes to see.

Notes and Comments

The Chemical Age Year Book

THE CHEMICAL AGE YEAR BOOK for 1936 is now in the hands of our subscribers and advertisers, and it is our pleasurable duty to acknowledge a large number of appreciative messages which have reached us during the week. The foreword to the fourteenth edition expresses the hope that the Year Book may be of constant service during 1936, and we are gratified to find that hope is translated into assurance in every direction. Year by year it is our endeavour to compress into the pages of the Year Book the type of information likely to be in daily demand in the laboratory, the office, the lecture room and the works. It is not an easy task in an industry so wide in its ramifications; it is one that can be achieved only with the co-operation of a great number of people in the industry itself, and we take this opportunity of offering our thanks to all who have made it possible to produce a more complete Year Book than in any previous year. A new feature that promises to be of particular value is the list of proprietary and trade names employed in the chemical and allied industries. The bibliography has again been considerably extended by the inclusion of new books published during the twelve months, and the other regular features have undergone a complete overhaul. We are especially indebted to the officials of the numerous societies for their assistance in presenting a list of organisations that is unique in its field. The advertisement section is more comprehensive and the announcements of plant makers and chemical producers, with the comprehensive buyers' guides, are arranged so as to allow readers easy access to the source of supply of their requirements. While the 1936 edition is still new we would invite readers to submit suggestions for further improvements, so that they may be filed for use when we return later in the year to the fascinating task of preparing the 1937 edition.

Depressed Areas

ONE of the most prominent of our present problems is that of finding work for all our people, or at least of ameliorating the conditions under which they live by bringing prosperity to most of them all the time and to all of them some of the time. The problem has been stated in terms of depressed areas because politically local government authorities can bring pressure to bear on the Government by laying stress on the intense burden of local rates and other similar localised occurrences. We should like to ask whether this is the correct way of regarding the problem; whether this method is in itself adequate and will lead to the desired result. Areas are depressed either because their works have been allowed to fall out of line with modern practice or because the trades upon which they are dependent have too great manufacturing capacity for the market demands. The North-East Coast is a depressed area, for example, largely because iron and steel capacity is too great. In spite of this being a depressed area, the steel-makers are working night and day. The engineering trade all over the country, however, is depressed. If, on the principle of helping depressed areas, engineering contracts are diverted to these districts, engineers in other districts will pass from depression into chronic depression; but because they are not technically in a depressed area, their plight will pass unnoticed. The essential difficulty here is that one busy industry may carry a district from the "depressed" category, into the "cheerful," with the result that the depression in all the depressed trades of the area is intensified. By all means let us create new industries to employ the labour that is surplus to the existing industries—that is the real problem, but let us beware of making arrangements that will only pay Paul by robbing Peter.

Nitrogen Production and Consumption

BRIEF reference was made in our Annual Review Number last week to the fifteenth annual report of the British Sulphate and Ammonia Federation, reviewing the trend of the industry during the thirty-eighth year of propaganda work undertaken successively by the Sulphate of Amonia Committee, the Association, the Federation, Nitram Ltd., and Imperial Chemical Industries, Ltd. The report shows that the world production of nitrogen in the fertiliser year 1934-35 was 2,041,366 metric tons, an increase of 13.9 per cent. over the preceding year, which in turn followed an increase of 6.9 per cent. The total world consumption was 2,030,861 metric tons, an increase of 8.2 per cent., preceded by an increase of 7.5 per cent. over 1932-1933. Agricultural consumption amounted to roughly 1,792,200 tons, or 7.1 per cent. more than in 1933-1934, which in turn showed a rise of 5.5 per cent. over the previous year. While production shows an improvement, synthetic nitrogen plants have on an average operated at only about 43 per cent. of capacity during the year. The world production capacity for synthetic nitrogen, including cyanamide, is estimated at 3,490,000 tons of nitrogen. Dealing with the home agricultural consumption of nitrogen, the report remarks that memory of the low price of sulphate of ammonia in 1932 has not yet faded from the minds of farmers, but as each year passes they tend to become more reconciled to the present reasonable levels. A considerable change has occurred over the whole face of British agriculture during the past twelve months, but the farmer's financial position has not yet recovered from the effects of the past, and there is still a general tendency to restrict purchases of fertilisers, feeding stuffs and implements to the margin of bare necessity. The Federation has, however, persevered in its propaganda efforts, and the prospects are considered satisfactory.

The Study of Alchemy

PROFESSOR J. R. PARTINGTON is at the head of a group of scientists who have formed themselves into the Society for the Study of Alchemy, a movement which, because of its fascinating romance, has attracted a good deal of popular interest. The excuse for adding yet another society to the long list of organisations already in existence is that the study of alchemy is important because of its relations with the history of early chemistry. Many of the most important chemical substances were first discovered by the alchemists, and certainly much of our chemical apparatus was worked out by them. For instance, they always had distilling apparatus which is almost identical, in principle, with that used to-day.

Developments in Bleaching Powder Production

The Krebs-Backman Plant

WITH the glut of chlorine from the alkaline industries it is not surprising to find increased attention being given to more efficient methods of preparing bleaching agents such as sodium hypochlorite, bleach liquor, and bleaching powder. Although this last year there has been yet further increase in production and utilisation of alternative bleaching agents, such as peroxides, perborates, etc., and although hydrogen peroxide of 99 per cent. purity is being transported in 8,000-gal. tank cars in the United States, this great development does not mean that any appreciable decline in chlorine agents will necessarily take place.

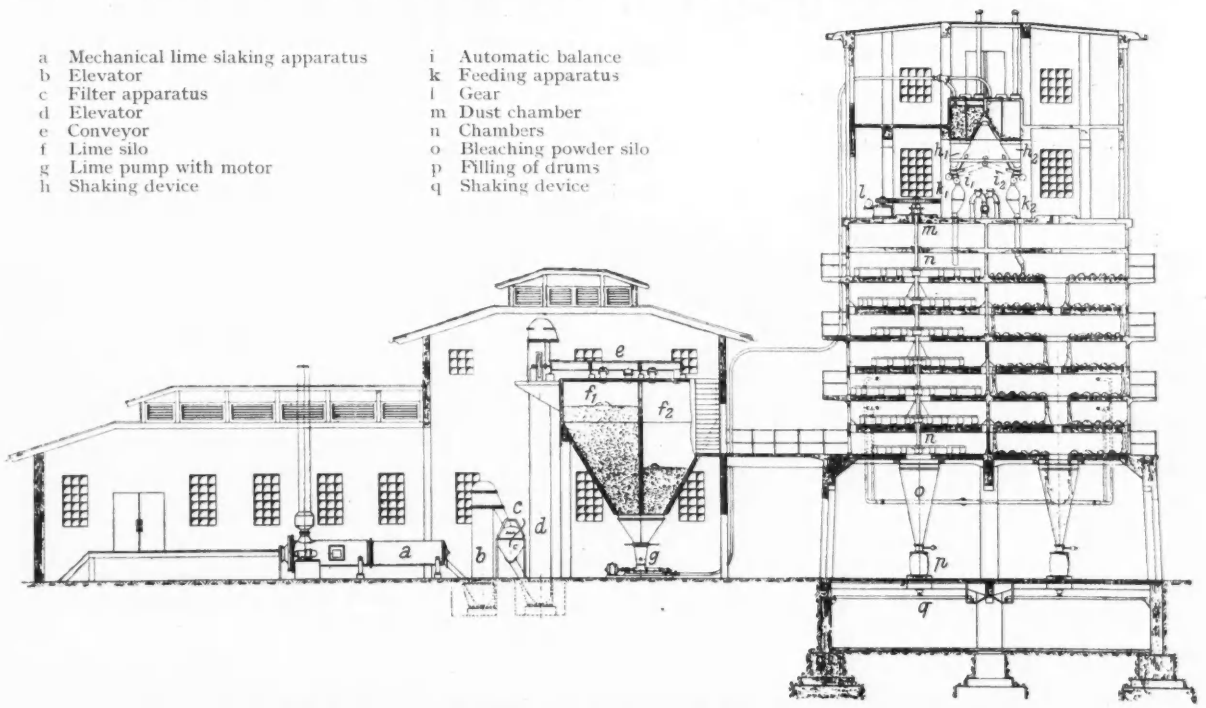
Bleaching powder still represents the cheapest form of agent available in commerce, and increased stability imparted in new forms means that certain objections to it have disappeared. Bleaching powder, moreover, may ultimately be required in large quantities for the purpose of decontaminating the towns of this country after poison gas attacks by enemy aircraft. Burnt lime with low magnesia and carbonate content together with electrolytic chlorine are raw materials available at low cost and in consistent quality, so that it is in producton methods that improvements have taken place. The old chamber method, consisting in spreading the lime slaked to 26 per cent. water content in layers a few inches deep on floors, still survives in cases where gas of at least 30 per cent. chlorine content is used. The latter must be dry, admitted slowly, the temperature of the chamber kept below 45° C., and the chlorine may conveniently be diluted with air until down to 40 per cent. by volume. But mechanical absorbers are the rule with gas below 30 per cent. chlorine, and are gradually displacing the older plants. In the United States a 12 ft. screw conveyor of cast iron has been in vogue for some time, the lime containing a slight excess of moisture and being worked in counter-current to chlorine diluted with air.

In Europe the tower plants introduced by Backman and constructed by Krebs and Co., of Oslo, have proved the most efficient of mechanical plants, an example in this country being the installation at the works of the Staveley Iron and Coal Co. The system of four hexagonal towers each holding eight floors raked by mechanical arms is comparable in operation to the Herreshoff sulphur furnace, chlorine gas of any concentration from 10 to 90 per cent. being admitted in place of the air in sulphur burners, while the rakes move the lime outwards on one floor and inwards on the next. All parts of the plant are accessible, the arms being protected by mixtures of Stockholm tar and an inert solid. Lime passes continuously from the hydration unit via silos to the tower feed hopper, compressed air being the motive power. The top floor acts as distributor since the waste gas is withdrawn from the floor below; similarly, the lowest floor serves to stabilise the product since free chlorine is evolved during the raking to and fro in this section. Temperature can be adjusted for any desired condition depending on the chlorine content of entering gases, tubular coils through which brine or warm water can be circulated being fixed on the floors.

While the tower system can be adjusted so that no free chlorine is present in the exit gases, some concerns combine the production of bleaching powder with that of sodium hypochlorite, earthenware fans removing the gases to the earthenware absorption towers for preparing the sodium derivative. Where the Backman type of plant gains in efficiency is in the possibility of adjustment of clearance of scraper arms, rate of lime feed, and other conditions such as temperature, in order to meet any changes in technique or in type of gas utilised.

In standard plants eight tons of bleaching powder per 24 hour working period are obtained for each tower, over chlorination and heating being cancelled. Labour costs are low, and plants producing up to 500 tons per week have been installed on the Continent. An increasing temperature of 35° to 40° C. is attained during the first stages of the chlorination process, this being lowered during the final stages; and since the

a Mechanical lime slaking apparatus
b Elevator
c Filter apparatus
d Elevator
e Conveyor
f Lime silo
g Lime pump with motor
h Shaking device
i Automatic balance
k Feeding apparatus
l Gear
m Dust chamber
n Chambers
o Bleaching powder silo
p Filling of drums
q Shaking device

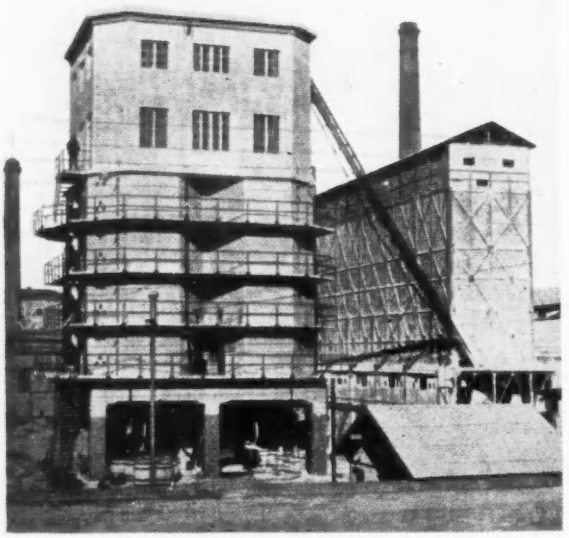


Section of a complete Krebs-Backman Bleaching Powder Plant, with lime slaking on the left.

powder issuing on to the last floor is treated with hot air to remove uncombined chlorine, there is no heat evolved due to chlorine absorption after packing—a distinct improvement on the chamber method product. For 10 tons of product energy consumption is round about 2 h.p., and raker-arms need renewal after nine months service on the third, fourth, and fifth floors.

G. Angel has shown that the condition of surfaces in reinforced concrete plants is an important factor. The inner surfaces should be smooth and without sharp corners, several towers being built together with one or two as reserve. The lime should be from mechanical hydrators and should not contain more than 0.5 per cent. excess moisture, while the highest temperature of 35° C. should be attained on the third shelf upwards. As low as 1½ h.p. per 5 ton chamber is claimed, although Backman plants work with a lower consumption than this.

In Italy a new product, or rather a form of bleaching powder made by novel methods, has been introduced under



Krebs-Backman Bleaching Powder Plant as erected in Spain, capacity 140 tons.

the name of "Sichlor." It was introduced by Carughl and Paoloni, and consists in chlorinating lime suspended in an inert liquid (like carbon tetrachloride) contained in jacketed reaction vessels. Stirring is used, the temperature being that used in other processes (35° to 40° C.), and after the mixture has been cooled to 20° on termination of the reaction, the carbon tetrachloride is removed under vacuum together with some water, and a crystalline or amorphous product obtained according to the conditions used. It is claimed that the product is exceedingly stable since the carbon tetrachloride maintains a better contact and regulation of temperature. The product has no smell of chlorine, is denser and less hygroscopic than ordinary bleaching powder, and can be kept at temperatures up to 80° without decomposition. To produce 100 kgm. of product from 20 to 25 kW of electrical energy and 10 kgm. of coal are required, the loss of carbon tetrachloride being 2.5 kgm.

This new Italian departure does not by any means exhaust the possibilities of new processes. The I.G. concern has protected the idea of using a small proportion of carbon tetrachloride or other inert liquid to be added to the lime prior to chlorination in order to avoid formation of lumps and to control the rise in temperature, the liquid being removed from the product by vacuum. "High-test" bleaching powder containing up to 65 per cent. chlorine is on the market in the United States, while Japanese products are claimed to contain even higher proportions. To increase the stability of the product the I.G. concern has introduced the use of a current of air at 160° to 180° C., while a second method of the same company involves the addition of 0.5 to 1.0 parts of quicklime per one part of water in the product, a current of hot air being then used to reduce water content to about one per cent.

Letter to the Editor

Manufacture of Disinfectants

SIR,—My attention has been drawn to your editorial of December 14, on the subject of my recent paper before the London Section of the Society of Chemical Industry. I have no quarrel with your editorial in so far as it confines itself to expressions of your own opinions. I must, however, protest against a statement with which you credit (or rather discredit) me to the effect that "manufacturers were concerned with making disinfectants, not with solving their customers' problems." I am certain I made no such statement. I may have suggested that the uses of disinfectants are so varied that the manufacturer, whose attention is necessarily concentrated mostly on manufacturing problems, could not be expected to be familiar with all the problems of application of his products. That does not mean he is unwilling to tackle, and advise on, any such problems as are brought to his notice by customers. The records of my own company, and, I am sure, of all reputable manufacturers of disinfectants, bear ample witness to the constant work being done in this connection.

You are quite correct in saying "modern industries find that development work in assisting in the application of their products is of the highest value," and I can assure you the disinfectant industry is no exception in this respect.—Yours faithfully,

JAS. GIBSON.

Jeyes' Laboratories,
London, E.13.

New Year Honours

Knighthood for Mr. R. G. Clarry

THE New Year Honours list published on Wednesday included knighthoods for four recipients prominently associated with industrial chemistry—Lieut.-Colonel Norman Seddon Brown, J.P., Mr. Reginald George Clarry, M.P., Professor Arthur Harden and Mr. Hector J. W. Hetherington. Colonel Brown is managing director of the Cellulose Acetate Silk Co., chairman of John Woodrow and Son, Ltd., and a member of the council of the British Cotton Growing Association and of the Federation of British Industries. Mr. Clarry, who is Member of Parliament for Newport, is executive chairman of the British Road Tar Association and a director of Monolithic Structures, Ltd., and Simon Brothers (Engineers), Ltd. Professor Harden is Emeritus Professor of Chemistry at the London University, and Mr. Hetherington is vice-chancellor of Liverpool University.

In the India list a knighthood has been conferred upon Mr. Kenneth Brand Harper, general manager of the Burma Oil Co., Rangoon.

Dr. Percival Hartley, M.C., D.Sc., director of the department of biological standards, Medical Research Council, received the C.B.E.

The O.B.E. was conferred upon Mr. George E. Holden, M.Sc., F.I.C., and Mr. Thomas Crook, A.R.C.S., M.Inst.M.M. Mr. Holden is technical adviser to the Dyestuffs Advisory Licensing Committee and vice-chairman and joint managing director of the English Velvet and Cord Dyers' Association. Mr. Crook is principal of the mineral resources department of the Imperial Institute.

The British Synthetic Fertiliser Industry

Progress at Home and Overseas

ANY sketch of the position and prospects of the British synthetic fertiliser industry is best preceded by a glance at the world nitrogen industry as a whole. In the fertiliser year 1934-35, that industry made good progress and, although total production was still below that in the last boom year, 1929-30, consumption was the highest on record, attaining, in terms of nitrogen, the peak of 2 million metric tons (including Chilean nitrate), and of this amount nearly 1.8 million metric tons was used in agriculture. Compared with the year 1933-34, world production increased by 13.9 per cent. and world consumption by 8.2 per cent. Further evidence of progress is afforded by the fact that although plant capacity increased by 110,000 metric tons (3¼ per cent.), the capacity actually utilised increased from 40 to 43 per cent.

Considering only production by synthetic-ammonia processes, the most noteworthy increases were made by Japan and Russia, with 56,500 and 21,500 metric tons respectively. Substantial, though less remarkable, increases were also made by Germany, Italy, Czechoslovakia and France. Among individual nitrogenous fertilisers, the most notable increase was scored by nitrate of lime, with 43 per cent. Calcium cyanamide was also prominent with an advance of 22 per cent., and it is interesting to recall that only a few years ago the prophets were predicting the early demise of this useful fertiliser and weed-killer.

Home Industry and Export Trade

Fertilisers containing ammonium nitrate and calcium carbonate, like the British nitro-chalk, which was the first in this field, and the German "Kalkammonsalpeter," are gaining in popularity in many countries; and fertilisers containing magnesium are attracting more attention. Sulphate of ammonia still reigns supreme in the realm of synthetic and by-product nitrogenous fertilisers; in the past year it represented 45 per cent. of all the nitrogenous fertilisers produced and consumed. Chilean nitrate, after years of depression, is again raising its head, thanks very largely to international co-operation, but the consumption of it still represents less than 10 per cent. of the world's consumption of nitrogen products.

The British synthetic fertiliser industry is concerned mainly with sulphate of ammonia, nitro-chalk, and the newer concentrated complete fertilisers (C.C.F.'s), which contain ammonium phosphate and potassium salts. Sulphate of ammonia is so well-established in the home market that it practically "sells itself." Although less was produced in 1934-35 than in the previous year, sales were more than maintained. Sales and consumption of nitro-chalk and C.C.F.'s were, however, considerably greater, so that sales of synthetic nitrogenous fertilisers as a whole made a decided advance. The same cannot, unfortunately, be said of the export trade. In years past large countries like Japan, Russia, Italy and France have been greatly increasing their domestic production, and apart from Japan these countries have now ceased to import.

Empire Trade Products

The British export trade is chiefly concerned with sulphate of ammonia, and in the year under review exports decreased by 18 per cent. compared with the previous year. Nevertheless, it is satisfactory to record that substantially greater shipments have been made to Portugal, Egypt and Java, and to Australia, Ceylon, India and British Guiana. If generalisation is permissible, it would appear that the future of our export trade lies more particularly within the Empire than without.

The increasing popularity from year to year of nitro-chalk and C.C.F.'s is one of the most satisfactory signs of the times, and there does not appear to be any reason why sales should not continue to increase. Nitro-chalk combines the virtues of both nitrate and ammoniacal nitrogen, and also provides the soil with sufficient lime to prevent the development of acidity, whilst C.C.F.'s, owing to the high concentration of plant-food in them, their granular form, and the intimate admixture of their ingredients, certainly save the farmer much trouble and, *ceteris paribus,* ensure the most effective use of the nutrients they contain.

Future of Synthetic Fertilisers

The immediate future of synthetic fertilisers in the world in general is by no means unfavourable. It is true that trade in these commodities is seriously hampered by existing economic conditions, and there are no signs at present that the present barrage of tariffs, quotas and other hindrances to free exchange is likely soon to be lifted. Over-production of food and fibre crops is only a local phenomenon and there is still very great scope for the use of fertilisers in most countries of the world. Statements to the effect that the continued use of inorganic fertilisers tends to deteriorate the soil, and to impair nutritive quality of produce, are not borne out by scientific investigation. The effects mentioned may and sometimes do follow their improper use; but here, as elsewhere, abuse is no argument.

Those who are in a position to judge are by no means pessimistic concerning the future of the home trade in synthetic fertilisers. The various marketing boards, although still in their infancy, are playing their part in the resuscitation of British farming; and that the improvement in trade and industry generally is being slowly reflected in the sphere of agriculture is shown by the rise in the average agricultural price index from 109 for the year 1933-34 to 115 for last year (exclusive of payments made under the wheat and cattle subsidies).

Improving the Quality of Food

Another consideration that tends to engender a feeling of hopefulness for the home industry is the growing realisation that the food of the people must be improved, particularly in regard to its quality. Sir John Orr, Sir Gowland Hopkins and others have emphasised the necessity for improving the under-nutrition which is so widely prevalent in this country; and the call rings clearly and loudly for a greatly increased home production of foodstuffs like dairy produce, meat, vegetables and fruit, which are rich in essential minerals and vitamins, but are, alas, often too costly for many to buy. Now grass is the basic material for the production of meat and dairy products, and there is no agriculturist of standing who does not think that we could immensely improve our grasslands by better cultivation and management, and by a much more liberal use of fertilisers, especially those containing nitrogen. Similarly the vegetables rich in minerals and vitamins, like cabbages, kales, spinach, water-cress and lettuce, all respond particularly well to judicious applications of nitrogen; and the same is true of practically all the bush fruits. A more abundant and effective use of fertilisers, including all the home-produced synthetic nitrogenous fertilisers, is therefore urgently required for growing these food crops of which the mass of the population has immediate need.

During the year the scope of the work at Jealott's Hill has been reorganised. Hitherto the station has devoted its efforts almost wholly to work on problems connected with the use of fertilisers. The results obtained during the six years since the station was opened, together with the work done at other agricultural institutions, has solved the major problems on the use of fertilisers. Perhaps the most notable of these

problems has been that of using nitrogeous fertilisers on grassland. Not only has this been solved and put into practice, but a grass drier has also been evolved and is now on the market. The possibilities which this has opened up to farming are being exploited at three I.C.I. farms which are being run by Colonel W. R. Peel. With the successful conclusion of several lines of work a series of new problems fundamental to agriculture are being attached. Perhaps the most important development is the opening of pest control laboratories to work on problems affecting agriculture and other industries. In general, the new developments entail an expansion on the biological side and some contraction on the chemical side. The station, as hitherto, is under the control of Mr. H. J. Page.

The Chemical Society in 1935

A Survey of the Year's Work

DURING 1935, the Chemical Society has held 17 meetings in London The fifth Liversidge Lecture, entitled "The Process of Coagulation in Smoke," was given by Professor R. Whytlaw-Gray on February 14; the Madame Curie Memorial Lecture by Dr. A. S. Russell on February 18; and the Brauner Memorial Lecture by Dr. S. I. Levy on November 14. Four meetings were devoted to discussions: February 17, "Intermetallic Compounds," opened by Professor C. H. Desch; March 21, "Recent Progress in the Chemistry of the Terpenes," opened by Professor J. L. Simonsen; May 16, "Significance of Phosphoric Esters in Biochemical Processes," opened by Professor R. Robinson; and November 21, "Some Aspects of the Interaction Between Gases and Solids," opened by Professor E. K. Rideal. Ten ordinary scientific meetings were held, 34 papers being read and discussed.

Thirty-two meetings were held outside London as follows:

Aberdeen.—May 17, joint meeting with Institute of Chemistry and Society of Chemical Industry, a paper on "The Utilisation of Peatland," by Dr. Ian M. Robertson.

Birmingham.—January 29, lecture on "Surface Reactions," by Professor E. K. Rideal; March 1, lecture on "Recent Progress in Sesquiterpene Chemistry," by Professor J. L. Simonsen; December 2, lecture on "Alkaloids—General Ideas and Methods," by Professor G. Barger; December 9, lecture on "The Decomposition of Molecules by Light," by Dr. R. G. W. Norrish.

Bristol.—February 15, lecture on "The Properties and Chemistry of Heavy Hydrogen," by Dr. L. Farkas.

Cambridge.—May 11, an ordinary scientific meeting, at which three papers were read and discussed.

Glasgow.—March 15, lecture entitled "From Governor Phillip to d-*neoiso* Menthol: The Story of a Research, 1788-1934," by Professor J. Read.

Leeds.—April 25, meeting for reading of papers; October 14, a lecture on "The Fat-soluble Pigments of Nature," by Professor I. M. Heilbron.

Liverpool.—January 25, a lecture on "Recent Developments in the Physical and Organic Chemistry of Long Chain Compounds," by Dr. J. C. Smith; February 27, lecture on "Solid Reactions and Explosive Decomposition," by Professor W. E. Garner; October 18, a lecture on "Some Recent Advances in Stereochemistry," by Dr. W. Wardlaw; December 10, a lecture on "Formation of Anthocyanins in Plants," by Professor R. Robinson.

Manchester.—January 24, a meeting at which five papers were read and discussed; February 14, a joint meeting with the Manchester Section of the Institute of Chemistry, a lecture on "Chemistry in the Service of Medicine," by Professor J. F. Wilkinson; October 10, a joint meeting with the Manchester Sections of the Institute of Chemistry and the Society of Chemical Industry, a lecture on "Modern Structural Chemistry," by Professor N. V. Sidgwick; November 26, a joint meeting with the University of Manchester Chemical Society, a lecture on "The Calcification of Animal Tissues," by Professor R. Robinson; December 6, joint meeting with the Food Group of the Society of Chemical Industry and the Manchester Section of the Society of Chemical Industry, a symposium on "Micro-Organisms and Foodstuffs."

Newcastle and Durham.—October 18, joint meeting with the local Section of the Society of Chemical Industry, at which several papers were read and discussed. Fellows were also invited to attend the three Bedson Lectures given during the year.

North Wales.—January 18, lecture on "Alchemy and the Alchemists" by Professor John Read; November 1, lecture on "Thermodynamics and Reaction Velocity" by Professor M. Polanyi.

Oxford.—October 26, joint meeting with the Oxford Alembic Club, a discussion on "Aromatic Character," opened by Professor R. Robinson, Dr. W. H. Mills, Dr. W. G. Penney, and Dr. L. E. Sutton.

St. Andrews.—January 11, lecture on "Some Problems in Relation to Complex Metallic Salts," by Dr. F. E. Mann; February 15, lecture on "Orientation of Substitutions in the Benzene Series," by Professor R. Robinson.

Sheffield.—February 1, lecture on "Some Recent Developments in the Study of Chemical Reaction Mechanism" by Mr. C. N. Hinshelwood; March 15, lecture on "The Simplest Free Radicals" by Professor F. Paneth; November 29, lecture on "Some Modern Views on Chemical Reaction Velocity" by Professor M. Polanyi.

South Wales.—January 21, lecture on "Isothermal Sol-Gel Transformation, or Thixotropy" by Professor Dr. H. Freundlich; March 21, lecture on "Recent Work in Molecular Structure" by Dr. N. V. Sidgwick; November 8, lecture on "Recent Investigations in the Chemistry of Gold" by Professor C. S. Gibson; November 22, a discussion on "Some Problems of Sugar Chemistry in Relation to Biology," opened by Professor W. N. Haworth and Dr. E. L. Hirst.

The 95th annual general meeting of the Chemical Society was held in London on March 28, the anniversary dinner taking place at Grosvenor House the same evening, with the Marquess of Reading as the principal guest.

In 1935, 228 Fellows were elected, compared with 218 in 1934. The "Journal" contained 434 original papers and 33 notes, in addition to the special lectures, the number of pages occupied being 1,850, and Volume XXXI of the "Annual Reports on the Progress of Chemistry" contained 408 pages. British Chemical Abstracts "A" (Pure Chemistry) comprised 7,601 in general, physical and inorganic chemistry, 519 in geochemistry, 2,617 in organic chemistry, and 5,918 in biochemistry, the total number of pages being 1,552, compared with 1,422 in 1934. Ninety-three applications for grants from the Research Fund were received, and grants amounting to £740 were distributed among 91 applicants. The use of the extensive library steadily increases. In 1934 there were 8,549 attendances compared with 8,399 in 1933; 5,525 books were borrowed, and the number of books in the library was 38,810.

ARGENTINE exports of animal by-products show increases during the first nine months of 1935, as compared with the corresponding period of 1934. Shipments of bones increased to 40,409 tons from 34,139 tons, and of miscellaneous fertilisers to 17,575 from 15,485 tons, while dried blood declined to 8,276 tons from 8,531 tons.

The Institute of Chemistry

Charter Jubilee Year Activities

IT was in February, 1935, that H.M. the King was graciously pleased to accord his patronage to the Institute of Chemistry in commemoration of its completion of fifty years under Royal Charter. This event was celebrated in July by a banquet attended by the Earl of Athlone and many distinguished guests, followed by a reception on the succeeding evening. The local sections of the Institute throughout the country have also since celebrated this event by functions at which the president (Professor Jocelyn Thorpe) and Mrs. Thorpe, and other officers of the Institute have been present. The local sections of the Institute have otherwise continued active, and have held meetings jointly with the local sections of other bodies. New sections have been formed in Cardiff, South Yorkshire and East Midlands.

The conference of honorary secretaries of local sections was held in July, when the question was referred to the Council as to the part which chemists could take in promoting new industries in distressed areas, this matter having received special consideration from the Newcastle and North-East Coast Section.

The lectures published by the Institute as separate monographs, during the year, included "Fifty Years of Chemistry," given by Dr. Arthur E. Everest in March; "Chemistry and the Body Politic" (Seventh Gluckstein Memorial Lecture), given by Sir William Bragg in October; a lecture on "Laboratory Organisation," given by Dr. Leslie H. Lampitt in November; and a lecture on "Food and the Consumer," by Dr. G. W. Monier Williams, given before the Bristol Section in October. The Eighteenth Streatfeild Memorial Lecture was given in December by Mr. E. R. Andrews, on "Chemistry in Local Administration." The third edition of "The Profession of Chemistry" was published in April.

Examinations of the Institute have been held as usual in London, Glasgow, Manchester and other centres, and the examinations for National Certificates in Chemistry have been continued jointly with the Board of Education (England and Wales), the Scottish Education Department, and the Ministry of Education for Northern Ireland. No award was made of the Meldola Medal for 1934, but the Frankland Medal and Prize were awarded to Mr. Leslie Rose.

The membership of the Institute now exceeds 6,400 Fellows and Associates. In spite of the increase of over 200 in membership, the number known to be unemployed shows a slight improvement on that of the previous year at the corresponding period.

After taking a vote from the Fellows and Associates, the Council entered into an agreement with the Councils of the Chemical Society and the Society of Chemical Industry to form a Chemical Council consisting of representatives of the three chartered bodies, and of industry for the purpose of promoting co-ordination of scientific and educational publications, the maintenance of the Library of the Chemical Society, and the co-ordination of the activities and administration of the constituent bodies in relation to these purposes. The new Council, which commenced its deliberations in July, has since held several meetings and has recently reported to the Councils of the three bodies on its preliminary proceedings, particulars of which will be published in due course.

Other matters in which the Council of the Institute has been interested during the year include the Sixth International Congress for Scientific Management, held in London in July; the Government of India Bill; the proceedings of the Parliamentary Science Committee; fumigation by hydrocyanic acid gas; the employment of alien chemists and other technical officers in beet sugar factories; draft specifications submitted by the British Standards Institution; the Report of the Poisons Board, appointed under the Pharmacy and Poisons Act, 1933; air-raid precautions; "academic freedom"; chemical appointments in the Colonial Service; and professional certificates and reports given in connection with company prospectuses.

The British Association of Chemists

A Period of Exceptional Activity

THE past year has been one of exceptional activity for the British Association of Chemists. Their established activities have been maintained and extended. Owing to the general improvement in trade, the call upon the Unemployment Benefit Fund has been considerably less than last year. Disbursements for 1933-34 were £712 and for 1934-35 £500. As a result of these improved conditions the Appointments Bureau has increased its utility and scope. An increasing number of employers have approached the Bureau direct in many instances offering posts commanding high salaries. During the past year 2,103 posts have been notified through the Bureau.

The Legal Aid Department has also been exceptionally active. During the past year £762 have been recovered for members. It should also be noted that, owing to the precedents established by the Association and to the legal advice given to members, all cases have been settled without having recourse to a court of law.

Apart, however, from the established activities the Association has been closely concerned with the new Pharmacy and Poisons Act, the proposed Rules to be annexed, and the Report of the Poisons Board. The Association is not only in full agreement with the principle of legislation which aims at the control of the manufacture and sale of poisons, but hopes that its scope will be extended. To this extent the Association has fully supported the Government. The Council was, however, given to understand before the Report of the Poisons Board was published that adequate provision had been made in respect of the whole profession regarding the prescribed qualifications which were to be required of those who were to supervise the manufacture of poisons contained in medicinal preparations. It was thus with some surprise that the Council noted, when the Report of the Poisons Board was published, that the Board dealing with the matter of qualifications had asserted, as a matter of fact, that the Institute of Chemistry was the only body which conferred certificates or other documentary evidence of competency in chemistry as such. University degrees and diplomas were specifically excluded from this category, and the British Association of Chemists was neither mentioned in the Report nor included in the Schedule.

The Council proceeded at once to draw attention to the inaccuracies of the Report and the president, Professor E. C. C. Baly, wrote a letter to "The Times" severely criticising its findings. A reply by Sir Gerald Bellhouse, chairman of the Poisons Board, was also published. The Council further took the matter up with the Home Office and requested its members to communicate with their Members of Parliament in the late Government. These steps had considerable effect. A very large majority of members of the

Association agreed to communicate with their Members of Parliament. Many members of the House replied individually and addressed letters to the Home Office requesting further information; a question was also asked in the House.

The Council next requested the Home Secretary to receive a deputation. Owing to the dissolution of Parliament and the election of a new Government this matter was deferred. The Association has, however, been assured that the Act and Rules will not be confirmed without full consideration of the Association's views. The Council of the British Association of Chemists further communicated with the Secretary of the Privy Council in regard to the assertions made by the Poisons Board concerning the position of the Institute of Chemistry, and received a reply substantially confirming the view the President and Council of the B.A.C. had expressed.

At the annual meeting of the Association which took place at Liverpool on November 30, the question was fully discussed and the action of the Council unanimously endorsed. Resolutions of protest passed unanimously at the meeting have been forwarded, on its instructions, to the Home Office.

Representatives of the Association were invited to give evidence before a Committee under the chairmanship of Sir William Beveridge. The matter at issue was the proposed extension of unemployment insurance to workers in receipt of more than £250 per annum. At this meeting the representatives of the B.A.C. described the operation of the Unemployment Benefit Fund and its successful record over a period of twelve years. Sir William Beveridge's Committee desired to know specifically what limit of salary, if any, ought, in the opinion of the Association, to be applied to the operation of unemployment insurance. The representatives expressed the view that there should be no limit. This opinion was confirmed by the annual general meeting and a resolution incorporating its views was forwarded to the Committee.

The Council feels satisfied with the progress which has, in all directions, been made. Membership continues to increase, showing an advance of 67 for the past year. In regard, particularly, to the action taken concerning the Poisons Board the Council has evidence that its policy has been widely endorsed by a large body of opinion outside the membership of the B.A.C. In this matter, as in all others, it has endeavoured to express not merely its own views but those which it believes are representative of the profession as a whole.

The Utilisation of Blast Furnace Gas

Great Potentialities as a Fuel

IN a paper which he read to the West Cumberland Society of Chemists and Engineers, on November 15, Mr. A. F. Webber, B.Sc., said that the development of the use of blast furnace gas has been hindered by the conceptions that it is essentially an inferior fuel, that, being a by-product, it has no "value," and, as a result, that it is not worth improving by treatment. All these ideas are false. Such gas, cleaned and cooled, has enormous potentialities as a fuel, possessing many advantages over other fuels available for iron and steelworks utilisation. The one inherent defect is the high proportion of inert gases in the composition of the fuel; only about 30 per cent. of the gas, by volume, is combustible and even this proportion, consisting of hydrogen and carbon monoxide, has a low calorific value.

Blast furnace gas is almost an ideal fuel for gas engines; its composition is such that high compression ratios are permissible in the engine cylinders so that extremely high thermal efficiency is attainable. Even the high proportion of inert gas in the fuel is less of a disadvantage here than elsewhere. Every internal combustion engine is really a hot-air engine in which some fuel, petrol, oil or gas is burnt in order to increase suddenly the temperature of the air enclosed in the cylinder so that its resulting expansion can be used to produce mechanical work. The nitrogen and carbon dioxide in the gas serve as an expansion medium quite as well as atmospheric air.

The aspect of the utilisation of blast furnace gas for furnace heating must be divided sharply into steel melting practice on the one hand and coke-oven, soaking-pit and mill furnace heating on the other. In the former sphere of utilisation, blast furnace gas is quite useless by itself, as even with regeneration carried to the utmost possible limit the flame temperature would be inadequate for steel melting. A mixture of coke-oven gas and blast furnace gas in a ratio of about 1 to 2 or 2½ by volume, or about 3 to 2 by calorific value has proved very well suited to open hearth steel making practice. Although from one point of view this is an aspect of the utilisation of coke-oven gas rather than blast furnace gas, yet the latter has its part to play. It is generally considered necessary, or at any rate highly desirable, to have a luminous flame in the open-hearth furnace. The tar and benzole in ordinary producer gas, when regenerated to temperatures of the order of 800° C., liberate particles of carbon which become incandescent on combustion, and some equivalent must be formed by "cracking" the stripped coke-oven gas or by supplementing the gas by tar additions. Successful results are being achieved by the use of cold coke-oven gas with tar additions, but there are advantages in regenerating the gas as well as the air, and producing luminosity as a result of the consequent cracking. There would be serious difficulties, however, in regenerating unmixed coke-oven gas. The checkers would necessarily be small, and would easily choke up with the carbon formed by cracking, while the dissociation of methane to liberate carbon naturally releases also the hydrogen, which increases the difficulties of flame control in the furnace.

A mixture of coke-oven gas and blast furnace gas is well suited to regeneration. The checkers can be of normal dimensions, while the low initial hydrogen content of the blast furnace gas allows considerable addition by regeneration to the hydrogen content of the mixed gases without approaching undesirable limits. The proportion of coke-oven gas can be varied from about 25 per cent. to about 40 per cent., the latter for fast melting with low oxidation losses. The blast furnace gas must certainly be fine-cleaned for this service—any dust in the gas has to pass twice through the regenerative system—and a low moisture content is important, since at regenerator temperatures this will tend to combine with the free carbon produced by cracking.

The complete elimination of producer gas from iron and steelworks practice demands also the use of blast furnace gas on soaking pits and reheating furnaces. Here its application has been very successful; not only are fuel and furnace maintenance costs reduced but, which is vastly more important, scale losses can also be substantially reduced. Soaking pits of the conventional regenerative type are in operation in this country using blast furnace gas with and without an admixture of coke-oven gas, and very successful results are reported. There are at present in this country no recuperative "one-way fired" soaking pits fired with blast furnace gas alone, but at one works this is used with a small proportion of coke-oven gas. In this case crude blast furnace gas is employed, which is practicable since it has not to pass through any form of recuperator or regenerator. The air only is preheated by the recuperator and the flame temperature using cold clean gas would scarcely be high enough for successful operation. Quite a small proportion of coke-oven gas would no doubt rectify this.

Hydrogen Production by the Badische Process—VI.

Removal of Carbon Dioxide and Sulphur

In continuation of notes on the Economics of the Synthetic Manufacture of Ammonia, published in "The Chemical Age," October 5 to November 16 inclusive, the present series deal particularly with the design of the plant for the production of hydrogen by the Badische Process.

FROM the discussion given in the last instalment it is now possible to indicate the lines on which the present plant should be designed.

Working pressure—20 atm. (Compressors and plant to be designed for 30 atm.)

Water required—4,500 gal. per minute = 270,000 gal. per hour, 6,500,000 gal. per day.

The gas will be drawn from the gasometers by the compressors.

Volume of gas—11,300 cu. ft. per minute @ 20° C.

Volume of CO_2 to remove—3,500 cu. ft. per minute @ 20° C. (Volume actually removed 3.150 cu. ft. per minute @ 20° C.)

Volume of gas leaving scrubbers—8,150 cu. ft. per minute @ 20° C.

Number of compressors required—six 3-stage machines, each 2,000 cu. ft. per minute.

Power Required per Compressor.

The power required to compress 2,000 cu. ft. to 30 atm. in three stages is given by $R = 3\sqrt{30} = 3.1$. Therefore HP = 2 × 95.5 × 3 (@ 90 per cent. mechanical efficiency) = 573. Each machine would therefore require 573 h.p. or a total power of about 3,000 K.W. to be arranged for. The actual power to compress 11,300 cu. ft. per minute to 20 atmos. would be $3\sqrt{20} = 2.71$, *i.e.*, 3 × 82.5 =

$$247 \times \frac{11,300}{1,000} = 2,790 \text{ h.p.}$$

The compressed gas should receive thorough water cooling, so that the temperature is as low as possible before entering the scrubbers. The solubility at 10° is only ¾ of that at 20°, so that any cooling below 20° obtainable is all to the good. It has been suggested to cool the gas to +5° C. and thereby cut the water volume required down to about one half, but the refrigeration required would be a serious addition to the power.

Size of Mains.

The volume of the gas entering the scrubbers will be about (slight variation will occur, owing to the CO_2 not obeying Boyle's law)

$$\frac{11,300}{20} = 565 \text{ cu. ft. per minute at 20 atm. pressure.}$$

This gas will be divided into six streams from each of the compressors, so that the mains can be designed for about 100 cu. ft. per minute each. If the rate of flow is 60 ft. per second the diameter could be :—

$$\sqrt{\frac{100}{60 \times 60 \times 0.786}} = \sqrt{.035} = 0.19 \text{ ft., or say } 2\tfrac{1}{2} \text{ inches.}$$

Pumps.

The pump will be required to throw 4,500 gal. per minute against 20 atmospheres pressure. Multistage centrifugal pumps would probably be best suited to this work; each could be arranged to deliver 1,500 gal. per minute against 30 atm., so that four such pumps would suffice. They will require motors for

$$\frac{(30 \times 2,120 \times 1,500)}{33,000 \times 6.25} \frac{1}{0.60} = 770 \text{ h.p. each (at 60\% efficiency).}$$

Part of this power, however, can be derived from the Pelton wheels. The Pelton wheels on to which the water from the scrubbers will be directed should provide a recovery of about 70 per cent. of the power of pumping the water. These would drive a generator which could be used to provide part of the power for the motors for the pumps.

The actual power required for the pumping may be estimated as :—

$$\frac{(4,500 \times 20 \times 2,120)}{33,000 \times 6.25} \frac{1}{0.60} = 1,540 \text{ h.p.}$$

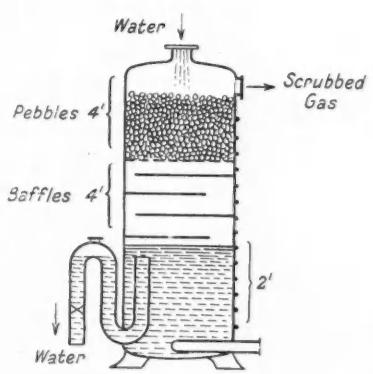
of which 70 per cent. = 1,080 h.p. is recoverable on the Pelton wheels, *i.e.*, 460 h.p. to supply.

Scrubbers.

As to the number of scrubbers required and their size and design, it can be stated that 44,000 cu. ft. of gas are scrubbed with 18,000 gal. of water per hour, in one scrubber which was estimated to be 10 ft. high × 4 ft. 6 in. in diameter. The gas contained 10 per cent. CO_2, and the issuing gas contained 0.75 per cent. CO_2. (The best working pressure was stated to be 15 to 20 atm., though a higher pressure (30 atm.) was supposed to have been recommended by the Badische Company.) The partial pressure of the CO_2 was, thus, about 2 atm. and 1 cubic feet of water would remove about 1.85 cu. ft. of CO_2 at such pressure (allowing for about 20° C. temperature),—4,400 cu. ft. would be removed by

$$\frac{6.25 \times 4,400}{1.85} = 14,808 \text{ gal.}$$

and allowing about 20 per cent. excess 14,800+2,960=17,760 or about 18,000 gal. would be needed. This agrees with the practical figure, which the company provided. The scrubber consisted of a steel cylinder filled as shown in the following illustration.



Volume of gas passing through scrubber = $\frac{44,000}{60 \times 60}$ = 12.2 cu. ft. per second, at 20° C. and normal pressure, or

$$\frac{12.2}{20} = 0.61 \text{ cu. ft. per second at 20 atm.}$$

Cross area of scrubber, 4 ft. 6 in. diameter = 15.9 sq. ft.

Net area of scrubber (say) 10 per cent. = 1.6 sq. ft.

Therefore *velocity* = $\frac{0.61}{1.6}$ = 0.38 ft. per second, and

time of contact = 10/038 = 26.4 seconds.

Volume of water = $\frac{18,000}{60}$ = 300 gal. per minute, = 5 gal. per second.

If the size of the present scrubbers is similar and they are made to take the same quantity of liquid, then

$$\frac{4,500}{300} = 15 \text{ scrubbers would be required,}$$

or on the basis of the total gas

$$\frac{11,300}{732} = 15.4 \text{ scrubbers.}$$

The above type of scrubbers do not give the maximum of liquid surface exposed to the gas for a given time of contact; it would be preferable if they were ring filled or half baffle filled and half ring filled. With a ring filled scrubber (3 inch) the free area being nearly four times as great as if pebble filled, the time of contact of the gas for the same size of scrubber could be four times as long and the liquid surface would also be doubled. It is suggested therefore that 12 scrubbers, ring filled, measuring, say, 10 ft. × 6 ft. would be ample for the whole plant.

The volume of liquid to be passed over each tower would be

$$\frac{4,500}{12} = 375 \text{ gal. per minute.}$$

and the volume of gas

$$\frac{11,300}{20 \times 12} = 47 \text{ cu. ft. at 20 atm.}$$

Suitable traps would have to be arranged at the exit of the water from the scrubber; and catchpots after the gas exits. The gas should enter at 20 atm. pressure in the system and would be deprived of its CO_2; the CO_2 commencing to pass into the water at the full 6.2 atm. pressure, the partial pressure of the CO_2 gradually becoming less as the gas passes up the scrubber. The water entering the system would contain CO_2 to the extent of the saturation quantity at atmospheric pressure, *i.e.*, under .0003 atm., so that the removal of the CO_2 could be practically complete. If the scrubber has a net area of

$$6^2 \times 0.786 \times 0.4 = 11.4 \text{ sq. ft.,}$$

the velocity would be $\frac{0.538}{11.4} = 0.047$ ft. per second, and the *time of contact* $\frac{10}{.047} = 210$ seconds. The removal, therefore, should be fairly complete.

Actually we shall assume 1 per cent. CO_2 is left in the gas, so that the composition of the gas leaving the scrubber would be

	atm.	solubility	gal.	
H_2	10,256,000	(less 12.3 × .0177 × 720 × 1,440 = 226,000 cu. ft.)	=	10,030,000
CO	393,000	(less .472 × .024 × 720 × 1,440 = 11,650)	=	381,350
CO_2....	5,057,000	(less 30/31 = 97%, i.e. 4,910,000)	=	147,000
H_2	590,000	(less .706 × .0164 × 720 × 1,440 = 11,900)	=	578,100
				11,136,450

i.e., composition of gas = 90 per cent. H_2, 3.4 per cent. CO, 1.3 per cent. CO_2, 5.2 per cent. N_2, and volume = 11,136,450 cu. ft. per day = 465,000 cu. ft. per hour, = 7,750 per minute, = 129 cu. ft. per second.

Mains.

The actual volume leaving each scrubber at 20 atm. pressure will therefore be $\frac{10.75}{20}$ cu. ft. = 0.538 cu. ft. per second, and the total volume 10.75 ft. requiring only a

$$\sqrt{\frac{.538}{60 \times 0.785}} = \sqrt{0.0114}$$

say 1½ inch main. All leakage should, of course, be avoided and the joints made good and welded if necessary.

Recovery of Power.

The gas should pass to expansion engines, where it can do work in expanding to atmospheric pressure and provide power. The recovery of the power of compression of the gas by expansion in reciprocating air engines may be calculated from the formula:—

$$\text{Work done} = 3.463\ P_3V_2 \left\{ \left(\frac{P_1}{P_2} \right)^{0.29} - 1 \right\}$$

where P_3 is the terminal pressure and V_2 the final volume, P_1 is the initial pressure in lb. per square feet.

The gas leaves at about 20 atm. pressure, the work

$$= \frac{3.463 \times 15 \times 7,750 \times 144}{33,000} \left\{ (20)^{0.29} - 1 \right\}$$

$$= \frac{581 \times 1.38}{33,000} = 2,430 \text{ h.p.}$$

This is the theoretical adiabatic expansion in one stage. The isothermal expansion would be

$$\text{Work done} = \frac{7,750 \times 15 \times 144 \times 2.303}{33,000} \log 20$$

$$= 1,510 \text{ h.p.}$$

With a two-stage expansion engine, it is probable about 1,800 h.p. would be recoverable, leaving only 1,450 h.p. to provide for the compression of the gas.

If desired, the expansion could be allowed to provide the refrigeration necessary to cool the water and gas for increasing the quantity of CO_2 absorbed by unit volume of the water; it is probable, however, refrigeration by ammonia machine would be more economical.

The number of compound expansion engines required to deal with the gas would be about four 2,000 cu. ft. machines. The gas should then go to two balancing gasometers to be boosted from there through the fractional combustion catalysers.

Water Supply.

The water should be used over and over again, the supply required being about 6,500,000 gal. per day, *i.e.*, about 3,000,000 gal. in the circuit; evaporation, etc., being about 100,000 gal. make up per day.

The size of the scrubbers are such that it is probable, the water required can be cut down to a minimum, *i.e.*, about 3,600 gal. per minute or the number of scrubbers in use might be reduced.

The water should be as pure and free from salts as possible to avoid corrosion of steel vessels and pipes.

Carbon Dioxide Obtained.

The CO_2 will be drawn by exhausters from the tail race of the Pelton wheels and such quantity as is required stored in gasometers (about two hours' supply (say) 400,000 cu. ft.). The volume obtained would be 3,410 cu. ft. per minute = 4,910,000 per day.

Hydrogen Obtained.

The quantity of hydrogen produced up to this point is about 15 per cent. in excess of what is required for the Haber plant, but it is not too much margin as a maximum to allow for on the whole plant.

General Arrangement.

The general arrangement of plant would seem, therefore, to be two units, consisting each of three 2,000 cu. ft. three-stage compressors providing gas to six 10 ft. scrubbers in parallel, which are in turn each fed in parallel by two multi-stage centrifugal pumps.

Each unit could thus deal with a maximum of about 4,000 cu. ft. of gas (at N.T.P.) per minute and erquire a maximum of about 1,500 gal. of water per minute.

Cost of Power.

The total energy required is under 3,250 × 24 × 0.745 = 58,000 K.W.H. for (say) 8,540,000 (*i.e.*, providing for 15 per cent. loss of hydrogen),

$$= \frac{58,000}{8,540} = 6.9 \text{ K.W.H. per 1,000 cu. ft. hydrogen, at 0.25 d. per K.W.H.}$$

= 1.72d. per 1,000 cu. ft. (without allowance for recovery of power from the gas).

= 0.77d. per 1,000 cu. ft., allowing for recovery.

Notes and Reports from the Societies

Institute of Brewing

Chemical Engineering in the Brewing Industry

AN item of expenditure in breweries, in which economies can often be effected, is that incurred in the boiler house and in the heating system in general, said Mr. M. B. Donald, M.Sc., M.I.Chem.E., F.I.C., in a paper on "Some Brewery Problems through the Eyes of a Chemical Engineer," read at a joint meeting of the Institute of Brewing and the Incorporated Brewers Guild, in London, on December 9.

In many breweries, said Mr. Donald, the load on the boilers is very variable so that with coal firing it is practically impossible to attain good combustion of the fuel and to avoid smoke. A large amount of heat can often be lost up the chimney owing to the necessity of using a large percentage of excess air. The boiler load can be smoothed out by maintaining an unfired but carefully lagged Lancashire boiler, containing water at the temperature of the steam, on the main steam line. This acts as an accumulator but for more careful control it is better to have a steam accumulator which is specially designed to maintain the steam pressure constant. Much heat is often lost in the steam lines owing to inefficient or incorrect lagging and the chemical engineer is trained to be able to calculate the optimum thickness of lagging for any particular case. Other subsidiary factors, such as water softening, are also very important and call for expert technical supervision.

The grinding of malt and its relation to the efficiency of extraction in the malt tun would assume an importance if it were not for the fact that ample water is available for leaching owing to the weak extract required. Economic grinding can only be obtained if the crushed material is removed as fast as possible after its initial crushing, or else much of the power is consumed in converting the product into small unstable briquettes. The normal size reduction for most materials should not be more than three to one. The speed of revolution of the rolls therefore should be about three times that of the rolls of the previous stage.

Problem of Correct Design

The correct design of a copper is also a very interesting problem, although it is difficult to do in practice because it is not easy to obtain a clear analysis of what happens when a wort is boiled. In other words, it is impossible to make a good design until the optimum time and temperature for each of the factors is properly known. In most food industries to-day demands are made on the ingenuity of the chemical engineer to carry out some heating operation with the least damage to the food and vitamin content of the product.

The correct filtration of the hopped wort in the hop back is another point which calls for comment, said Mr. Donald. The proper removal of the solids at this stage is necessary because of the coating of the yeast cells and also because of the possibility of a harsh flavour being transmitted to the beer. Hop backs do not appear to be designed as very efficient filters and perhaps a monel metal screen with a precoat of filter aid might result in a clearer wort.

The filtration of beer is generally carried out in pulp filters and the use of filter presses using filter aids does not appear to have been in much favour. This appears to be due to two main causes. In the first place, ordinary unpurified kieselguhr has been used and this has given an unpleasant flavour to the beer. In the second place, the filters have not always been adapted to give good cleaning facilities. Neither of these problems is insoluble and in fact this method is used widely in the United States for lagers. The advantage of using a filter aid is that it enables the capacity of a filter press to be increased, sometimes even as much as fivefold, and this is, of course, of great importance when the plant is required to meet a sudden demand.

Institute of Chemistry

Utilisation of Acetylene and Acetaldehyde

THE technical utilisation of acetylene and acetaldehyde was the subject of a lecture which Dr. Frederick A. Mason, M.A., F.I.C., delivered befire the Leeds Section of the Institute of Chemistry on November 25. Since about 1900, various attempts have been made to utilise acetylene as the raw material of chemical industry with greater or less success, and at present the gas is made use of in four main directions: (i) chlorinated derivatives, (ii) acetaldehyde, acetic acid, *n*-butyl alcohol and acetone, (iii) vinyl plastics, (iv) chloroprene, and "Duprene" synthetic rubber.

Acetylene readily adds on chlorine in the presence of antimony pentachloride, to form tetrachlorethane, boiling at 146° C. On distilling this with milk of lime trichlorethylene is formed (b.p. 87°):—

$$2CHCl_2.CHCl_2 + Ca(OH)_2 = CHCl:CCl_2 + CaCl_2 + H_2O.$$

By further addition of chlorine, pentachlorethane is formed (b.p. 162°)$_2$ C_2HCl_5, which in turn affords perchlorethylene on treatment with milk of lime, C_2Cl_4 (b.p. 121°), and further addition of chlorine yields hexachlorethane (m.p. 188° b.p. 185°). Tetrachlorethane with zinc dust yields *cis* and *trans* dichlorethylene, CHCl:CHCl b.p. 60° and 48°, respectively. These various products form a useful series of non-inflammable solvents for dry-cleaning, oil-extraction, etc., trichlorethylene being widely used for dry-cleaning under various trade names. Trichlorethylene, in particular, is of interest in that it is readily hydrolysed by hot sulphuric acid to chloracetic acid, whilst when heated with aniline and milk of lime it yields phenyl glycine, $C_6H_5.NH.CH_2COOH$, the intermediate for synthetic indigo.

In presence of a mercury salt acetaldehyde is readily absorbed by warm dilute sulphuric acid to form acetaldehyde,

$$CH:CH + H_2O \longrightarrow CH_3.CHO.$$

The acetaldehyde so formed is readily oxidised by air in presence of a manganese catalyst to form glacial acetic acid. This process is niw very widely used, and in Canada the Shawinigan Co., Ltd., have a plant with a capacity of 17,500 tons per annum. The acetic acid, after dehydration to the anhydride, is used mainly for the preparation of cellulose acetate.

In this country (apart from a smaller plant at Billingham, belonging to Imperial Chemical Industries, Ltd.), acetaldehyde is prepared at Saltend, near Hull, by Industrial Solvents, Ltd., by the dehydrogenation of ethyl alcohol over a heated silver gauze catalyst:—

$$C_2H_5.OH = CH_3.CHO + H_2.$$

The aldehyde is then oxidised in the normal manner to acetic acid, the plant having a capacity of about 10,000 tons per annum. In addition, a further amount of aldehyde is condensed to aldol by means of caustic soda, the product dehydrated to form crotonaldehyde and the latter then reduced catalytically by the by-product hydrogen, to form *n*.butyl alcohol:

$$2CH_3.CHO = CH_3.CH(OH).CH_2.CHO \xrightarrow[+H]{-H_2O} CH_3.CH:CH.CHO \longrightarrow CH_3.CH_2.CH_2.CH_2.OH.$$

This plant has an annual capacity of about 1,500 tons finished product.

A further recent development consists in absorbing acetylene in glacial acetic acid in presence of a mercury catalyst, when there are formed successively vinyl acetate (b.p. 73°) and ethylidene diacetate (b.p. 166°):

$$CH:CH + CH_3.COOH \longrightarrow CH_2:CH.O.COCH_3 \text{ (vinyl acetate)}$$
$$\xrightarrow{+HO.CO.CH_3} CH_3.CH(O.CO.CH_3)_2 \text{ (ethylidene acetate).}$$

The latter, on distillation in pressure of a mercury salt, splits up into aldehyde and acetic anhydride:

$\longrightarrow CH_3.CH(O.CO.CH_3)_2 \longrightarrow CH_3.CHO + O(CO.CH_3)_2$,

thus affording a relatively simple means of obtaining acetic anhydride. Vinyl ester, on the other hand, polymerises readily to resinous products which are now widely used as constituents of lacquers, and as valuable plastic materials such as the "Mowiliths," "Alvar," "Gelvar," etc., and in conjunction with vinyl chloride as constituents of "Vinylite" resins. This represents an important and rapidly developing outlet for acetylene.

Lastly, as shown by Professor Nieuwland in the United States, acetylene is readily polymerised by means of aqueous cuprous ammonium chloride, to form vinyl acetylene, $CH_2:CH.C:CH$ (b.p. 5°), and divinyl acetylene, $CH_2:CH.C:C.CH:CH_2$, of higher boiling point. Vinyl acetylene adds on hydrochloric acid to form 2.chloro.1:3.butadiene, the chlorine analogue of isoprene:

$CH_2.C(CH_3)=CH.CH_2$ — Isoprene

$CH_2=C(Cl).CH=CH_2$ — Chloroprene

which is known as "chloroprene," and this readily polymerises to an extremely valuable type of synthetic rubber, termed "Duprene," which is now made by Du Pont de Nemours and Co. in America.

Duprene has many valuable properties, amongst them being its resistance to oil and petrol which makes it of great use in many branches of engineering. The Deepwater plant of the Dupont Company now has a capacity of 1,000,000 lb. of Duprene per annum. In Russia, also, it is understood that the Soviet Government is building plants for the manufacture of chloroprene rubber, to be known as "Sovprene." It will be seen, therefore, that the acetylene industry is already of great importance and its uses will undoubtedly increase still more in the future.

Dr. Mason's lecture was illustrated by specimens and slides kindly loaned by Shawinigan, Ltd., Imperial Chemical Industries, Ltd., Industrial Solvents, Ltd., and by the I.G. Farbenindustrie.

FOR the past year the efforts of the Office International de Chimie at Paris have been directed toward centralisation of chemical information with a view to facilitating research in this branch of science. At a recent meeting of the permanent committee of the Office, the work accomplished during the past year was reviewed and plans for an extensive future campaign were discussed. Outstanding among the accomplishments of recent months was the publication of an international index of centres of chemical information, listing the various organisations from which scientific, technical, and economic data on chemical questions may be obtained. Supplementing this publication, an index of chemical publications is under preparation.

Death of Mrs. H. E. Armstrong

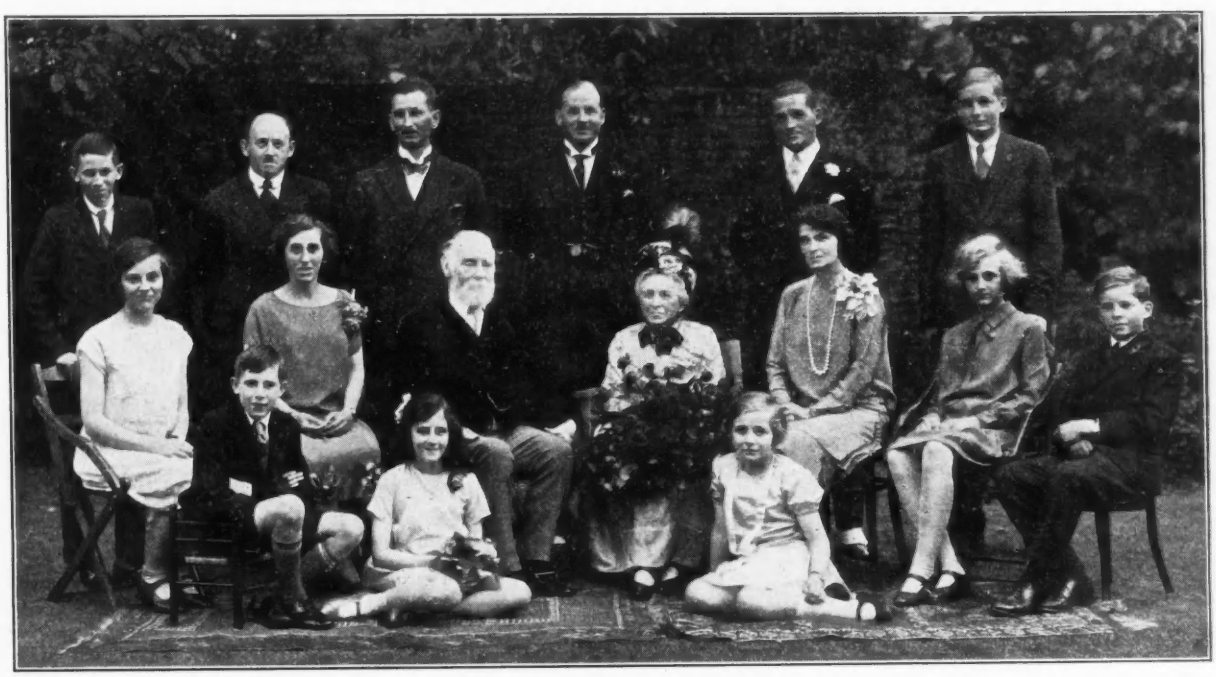


Photo by Langfier, Ltd., London.

WITH deep regret we record the death, which occurred on Christmas Day, of Mrs. Frances Louisa Armstrong, wife of Professor H. E. Armstrong, F.R.S., of 55 Granville Park, Lewisham. Mrs. Armstrong was in her 93rd year, and had enjoyed well over 58 years of happy wedded life, having married Professor Armstrong on August 30, 1887. Happy memories are revived by the accompanying family group photograph taken at their golden wedding celebration in 1927, at which Mrs. Armstrong, as the "senior partner," was called upon by her husband to speak first in response to the congratulations showered upon them. In commenting upon the celebration at the time, THE CHEMICAL AGE referred to Mrs. Armstrong as "a woman as remarkable in her character and sphere as her husband has been in his, belonging to the type of women who make great careers possible to husbands and sons, surrounded by sons all distinguished in one way or another and by a group of grandchildren who promise to carry on honourably the family tradition."

The sympathies of all our readers will go out to the Grand Old Man of the chemical profession in his irreparable loss. The funeral service was held at the Church of the Ascension, Blackheath; the interment at Nunhead Cemetery.

Personal Notes

MR. H. T. PROTHEROE has been appointed assistant lecturer in metallurgy at Sheffield University.

DR. W. H. GEORGE, Sorby research fellow, has had the title of honorary lecturer in physics conferred upon him by Sheffield University.

MR. JOHN MCGOWAN, who was employed for 60 years in the Alexandria Works of the United Turkey Red Co., Ltd., has died.

MR. J. CUNNINGHAM, of Bradford, director of the British Cotton and Wool Dyers' Association, left £37,395, with net personalty £36,157.

MR. MEINSTER, chief chemist of the Distillers Co., Ltd., recently gave a lecture at Leith on "Yeast Culture," giving numerous demonstrations in chemistry, illustrated by lantern slides.

SIR EDMUND DAVIS, chairman of a number of British mining companies, has taken up an option on tungsten mines at Tshontanda, near Wankie, in Southern Rhodesia, where he has sponsored a year's development work. The new company will be known as St. Swithan's Ores and Metals, Ltd., and has been formed to work the large wolfram deposits at the mine. The output of the mines in 1934 was valued at £10,800.

Mr. Alfred G. Waterhouse, J.P., a director of Peter Spence and Sons, Ltd., chemical manufacturers, was the recipient of two interesting presentations at the head office of the company at Manchester on December 13, on his completion of fifty years' service with the company.

MR. A. M. WISEMAN, M.C., British Trade Commissioner in Toronto, will be on duty in the Department of Overseas Trade, 35 Old Queen Street, Westminster, S.W.1, for the first half of January for the purpose of giving advice to United Kingdom firms who may wish to consider exhibiting their products at the Canadian National Exhibition this year. This exhibition has been held annually for the past fifty-six years and lasts for a period of fourteen days, at the end of August and the beginning of September.

MR. G. C. STONE, metallurgist and inventor, has died in New York. Mr. Stone had been associated with the New Jersey Zinc Co. from 1882 to 1929, when he retired. He held important metallurgical patents on the manufacture of sulphuric acid, gas filtration and separation, zinc and lead extraction from ores, a new form of jig, a gas producer, and flotation apparatus. He contributed many articles on metallurgy to scientific journals. In February, 1935, he received the James Douglas Gold Medal at the annual meeting of the American Institute of Mining and Metallurgical Engineers for distinguished achievement in non-ferrous metallurgy.

MR. L. ANDERSON, A.I.C., M.Sc., manager of the fine chemical department, has been appointed a director of Boots Pure Drug Co., Ltd. Mr. Anderson, who joined the company in February, 1918, was educated at Archbishop Holgate's Grammar School, York, and studied at Leeds University from 1911 to 1915, graduating as M.Sc. in the latter year. Subsequently he was elected an associate of the Institute of Chemistry. During 1915 and 1916 he was responsible for organising the testing of explosives in the north of England for the Woolwich Arsenal authorities and from 1916 to 1918 was manager of an explosive and acids manufacturing works in Yorkshire. He joined Boots Pure Drug Co., Ltd., as chemist in charge of saccharin manufacture, and in 1922 took out the first chemical patent acquired by the firm. In 1927 he was appointed manager of the fine chemical department at Island Street. He was chairman of the Nottingham section of the Society of Chemical Industry from 1933 to 1935, and has been prominently identified with the Nottingham City Business Club and the Nottingham Association for Unemployed Workers. He played hockey for Boots from 1919 to 1930, has been president of the Notts County Hockey Association and possesses a similar record of service in the sphere of lawn tennis. He is now a keen golfer. His appointment to the board recognises Mr. Anderson's valuable work in the fine chemical field in which Boots Pure Drug Co., Ltd., have made big strides during recent years.

Mr. J. Anderson

MR. W. GLAHOLM, a well-known Jarrow chemist, died suddenly on December 28, while on his way to work.

MR. S. G. FRANKENBURG, director of Greengate and Irwell Rubber Co., left £180,804.

SIR GEORGE ALBU died in Johannesburg on December 27. He was chairman and managing director of the General Mining and Finance Corporation, Ltd., and a director of Crown Mines, Ltd., and East Rand Proprietary Mines. In 1887 he became a naturalised British subject and was created a baronet in 1912.

MR. P. C. GILCHRIST, F.R.S., who was associated with the late Mr. S. C. Thomas in the introduction of the basic Bessemer process for the production of iron, died on December 15, aged 83 years.

DR. J. J. FOX, deputy Government Chemist, has been appointed by the Lords Commissioners of the Treasury to succeed Sir Robert Robertson as Government Chemist from April 17 next, the date on which Sir Robert Robertson's retirement takes effect. Dr. Fox joined the Excise Service in 1896. Later he was put on the staff of the laboratory of Customs and Excise, which was eventually amalgamated with the Customs House staff and made into the Government Chemist's Department. He became deputy Government Chemist in 1929.

Dr. J. J. Fox

MR. WILLIAM GREY THOMAS, of Falkirk, who had been in the employment of Scottish Dyes, Ltd., for 15 years, has died after a short illness.

MR. J. P. GREENE, an analyst employed at the Government Laboratory at Clement's Inn, London, was killed by a police car in West Ealing on December 27. A verdict of accidental death was returned at the inquest on Tuesday.

MR. J. D. DODDS, who is retiring from the post of manager of the Cookson Lead and Antimony Co., Ltd., Newcastle-on-Tyne, has been the recipient of a presentation. Mr. Dodds has been with the firm for 46 years, starting as a junior clerk. Presentations were made by Mr. Clive Cookson, chairman of the firm, and Mr. H. S. Tasker on behalf of the directors.

MR. G. J BELLINGER, for many years manager of Frederick Allen and Sons (Poplar), Ltd., manufacturing chemists, Phœnix Chemical Works, Poplar, retired at the end of the year. Mr. Bellinger started as a junior wtih the company in January, 1887, and thus completed 49 years of active service. The many friends he has made in the wholesale chemical trade will wish him well in his retirement.

MR. W. H. BARRITT died at his home at Hazel Grove on December 8. Mr. Barritt was chairman of the Allied Association of Bleachers, Dyers, Printers and Finishers, and acting chairman of its wages committee, in which capacity he took a prominent part in the recent labour negotiations. For ten years he was chairman of the Employers' Federation of Dyers and Finishers, and he represented the allied trades on the National Federation of Employers' Organisations. He attended two or three times at the International Labour Conference at Geneva as one of the technical advisers of the British Government and he took a prominent part in the various discussions on the 40-hour week question. Mr. Barritt's other activities included membership of the council of the Federation of British Industries, membership of the executive committee of the Manchester District of the Federation, and membership of the Joint Committee of Cotton Trade Organisations. He was the proprietor of the firm of John H. Earl, of Chorlton Street, Manchester.

MR. A. C. E. SINGER died on December 18, after a long illness, at the age of 71. Mr. Singer was born in Jaegerndorf, in what was then Austrian Silesia. He secured the State Diploma in Chemistry, and for a number of years held various appointments as an engineer-chemist in Austria. He then went to Frankfort-on-Main, where he joined the firm of Casella and Co., aniline dye manufacturers, who are now part of I. G. Dyestuffs, Ltd. He settled in England, where he became the technical head of the Bradford branch, in 1902, and became a British subject in 1907. During the War he carried on the production of aniline dyes in this country, being in technical charge of a dyeworks in Wakefield, afterwards becoming one of the English directors of I. G. Dyestuffs, Ltd., and retiring from this post five years ago. Mr. Singer had travelled extensively on the Continent of Europe, including Russia, and also in the United States and Canada. He had very wide interests of a literary and scientific nature, and published a number of articles on scientific subjects. He was a linguist of marked ability.

DR. MAX HENIUS, internationally-known chemist and expert on fermentation problems, has died in Jutland. Dr. Henius was a native of Denmark, received his education in Germany, and went to the United States in 1881. With Robert Wahl he formed the Wahl-Henius Institute in Chicago, which analyses beer and yeast products and trains brewmasters, and was responsible for many improvements in brewing. He was director-general of the first American Brewery Exposition, held in Chicago in 1911, and was an honorary member of the United States Brewers' Association, the United States Brewmasters' Association, and the Danish Brewmasters' Association. He was a member of the American Chemical Society, the Chemical Society, and the American Academy of Science.

THE MARQUESS OF READING, P.C., died on December 30 from heart failure. Lord Reading was president and also a member of the general purposes and finance committees of Imperial Chemical Industries. He was on the board of the National Provincial Bank, Ltd., and was chairman of Carreras, Ltd. He was also chairman of the Palestine Electric Corporation and deputy-chairman of the London and Lancashire Insurance and the Law Union and Rock Insurance Co., and was also on the board of the Finance Co. of Great Britain and America and the Marine Insurance Co. First attracted to politics in 1904, he sat for Reading from that year until 1913. In October, 1913, he was appointed Lord Chief Justice of England, and held that position until 1921. He was made a peer in 1914. As president of the Anglo-French Loan Mission he visited the United States in 1915. An earldom was conferred upon him in 1917, and in the same year he visited America as special envoy to the United States. In the following year he paid another official visit as Ambassador Extraordinary to the United States. Lord Reading was appointed Viceroy of India in 1921. On his return at the end of his Viceroyalty in April, 1926, he was raised to the rank of Marquess, and became Captain of Deal Castle.

Compliments of the Season

Calendars and Diaries Received

CALENDARS and diaries have again been made the medium of expressing the good wishes of a number of firms in the chemical and allied industries to their friends on the occasion of the new year. We take this opportunity to thank those who have sent us the gifts referred to below and of reciprocating their good wishes.

From the Staveley Coal and Iron Co., Ltd., we have received a leather-bound pocket diary with a convenient refill for the second half of the year.

The wall calendar issued by the Clayton Aniline Co., Ltd., is, as usual, a work of art. This year's illustration is a picture of "Contentment," from an oil painting by W. L. Grace, a comparatively newcomer who has made great progress in the world of art. The colouring is in itself a striking testimony to the products of the colour chemist.

Venesta, Ltd., expresses its wishes for a prosperous 1936 by sending a set of refill slips for the company's day by day desk diary, a constant reminder of the uses of Venesta products.

Carty and Sons, Ltd., have issued refill cards for their office calendar.

Gale and Polden, Ltd., printers, send us a tasteful wall calendar, illustrated with a reproduction of an early demonstration of printing by Caxton.

A giant telegram, four times the usual size, but a perfect reproduction of a telegram received by the Lord Mayor of Hull (Alderman Frederick Till), is the enclosure with the new year's greetings sent on behalf of the citizens of Hull to 15,000 business men in all parts of the country. The telegram advises the Lord Mayor, who is also chairman of the Hull Development Committee, that the British Cocoa Mills (Hull), Ltd., have now completed their new Hull mill and have started production of cocoa butter for the home and overseas markets. The directors of the company paid tribute to the facilities of the city and port and to the assistance afforded by the Hull Corporation.

JAPAN has hitherto covered its requirements in citronella oil by imports averaging annually about 200,000 yen, according to unofficial sources. In two or three years' time, however, it is hoped there will be no further need for imports. The producing company, the Takasago Perfume Co., Ltd., (Takasago Koryo K. K.) has manufactured this year about 60 tons of citronella oil from its own plantations in Formosa.

Far Eastern Chemical Notes

China

EXTENSIVE ANTIMONY DEPOSITS are reported to have been located in the southern area of the province of Kiangsi.

COTTON SEED IS THE RAW MATERIAL for a new motor fuel developed by the Highways Commission of the provinces of Kiangsu, Tschekiang and Anhui, reports the Chinese Economic Bulletin. Following encouraging preliminary experiments, the Commission has placed an order for a considerable amount of cotton seed with a view to large-scale manufacture.

Japan

STATE ENCOURAGEMENT OF COAL HYDROGENATION has taken the form of a subsidy of 4.5 million yen for the year 1935-1936 by the Ministry of Commerce.

THE NEW ACETIC ACID PLANT of the Showa Gosei Kagaku K.K. is approaching completion, March or April being mentioned as the probable date for commencement of production.

EXPERIMENTS INITIATED BY THE STATE EXPERIMENTAL DEPARTMENT, Formosa, are reported to have resulted in a new method for making synthetic menthol based upon a by-product of camphor extraction. An experimental plant is being built to test out the process ("Yakogyohio").

Continental Chemical Notes

Switzerland

TWO OIL EXPLORATION COMPANIES have started drilling operations in the cantons of Waadt and Neuchâtel, where oil is expected to be struck at depths of 2,000 to 6,000 feet.

Czechoslovakia

WITH A VIEW TO SUPPLYING RAW MATERIALS to the Bata Rayon Factory at Batizovce, which is already operating, a separate company, Svit A.-G., has been formed with a capital of 10 million crowns to supply cellulosic materials including transparent paper. Wood pulp will be derived from forests in the neighbouring Tatra region.

Belgium

A NEW PAINT AND LACQUER WORKS, the Compagnie Generale des Laques, has started production at Anderlecht.

ACCORDING TO A BRUSSELS REPORT, the Produits Chimiques du Marly has erected a nitric acid factory and is also going ahead with the erection of ammonium chloride and sodium nitrate plants.

Esthonia

A PERMIT HAS BEEN GRANTED to the Eesti Destillant concern to import from Germany the equipment for a phenol-formaldehyde synthetic resin plant. The initial annual output is expected to reach 600 tons, the greater part of which is dentined for export.

Russia

EXPERIMENTAL CULTIVATION OF CINCHONA in the Caucasus has produced encouraging results and the first batch of quinine was prepared at the end of November by the Suchum Plant Institute.

CULTIVATION OF CITRUS FRUITS on a vastly increased scale is to be undertaken in Georgia where the existing cultivated area of 3,280 hectares is to be increased to 20,000 hectares by 1,940.

THE FIRST SYNTHETIC FATTY ACID PLANT for which sulphurised and oxidised kerosene forms the raw material was started up at Kazan in June, 1935. This process also yields naphthene sulphonic acids which find application as "petrow contact" materials for fat-splitting. The present annual capacity of the plant is 10,000 tons fatty acids (for use in the varnish and soap industries) and 2,000 tons fat-splitting agents.

Germany

FRESH ACTIVITY HAS DEVELOPED in the mercury industry of the Palatinate, reports the "Chemische Industrie." Following reopening of the mines in the Upper Moschel district by the Deutsche Montangesellschaft, of Wiesbaden, various deposits are now being worked. Mercury is mainly present in the form of cinnabar which is first broken up by blasting. The coming year is expected to result in a mercury output of 120 tons, representing one fifth of the present German import requirements.

Poisons List and Rules

To come into Operation on May 1

THE Poisons List and Poisons Rules will come into force on May 1. From that date the main provisions of the Pharmacy and Poisons Act, 1933, relating to the sale, distribution, etc., of poisons come into operation and the existing statutory provisions and regulations will be repealed. The Poisons List is divided into two parts. In Part I are those substances the sale of which is to be restricted to authorised sellers of poisons (*i.e.*, registered pharmacists). In Part II are those substances which may be sold only by registered pharmacists and persons registered in accordance with the Act with the local authorities for the purpose. The latter part includes various poisons commenly used for agricultural, horticultural, sanitary and domestic purposes.

Broadly, the Poisons Rules codify the existing requirements, and impose certain additional restrictions, including, notably, regulation of the transport of poisons, prohibition of the sale to the public of certain potent medicinal poisons except upon a prescription given by a qualified medical, dental or veterinary practitioner, and prohibition of the sale of strychnine except for medicinal purposes.

Copies of the Poisons List, the Poisons Rules and the form prescribed for application to be made to the local authority for registration for the sale of the substances in Part II of the Poisons List have been placed on sale and may be purchased from H.M. Stationery Office or through any bookseller.

I.C.I. and Coal Prices

Offer to Pay More

IMPERIAL Chemical Industries, Ltd., has notified the Secretary of the Mines Department, Capt. Harry Crookshank, M.P., that it is prepared to agree to an advance of 1s. a ton on coal over 1935 prices under all the forward contracts of companies under its control in the United Kingdom. It is estimated that the company consumes about 2,500,000 tons of coal annually, and that the cost of the proposed increase will therefore be £125,000 a year.

Sir Harry McGowan, chairman, in a letter to Capt. Crookshank, states that the company will not, as a direct consequence of the decision, make any advances in the sale prices of its own products. The letter continues: "My Board have followed closely the course of the present dispute arising out of the miners' claim for an immediate increase in wages, a claim which has met with widespread public sympathy. Under the present organisation of the industry it appears beyond dispute that an advance in wages can only be secured by an increase in the price of coal to the consumer. To permit of this step, industrial and other concerns have been asked by the district associations of owners to agree to increases of price under existing forward contracts."

From Week to Week

THE GOVERNMENT SOAP FACTORY at Bangalore has issued an attractive collection of pictorial views of Mysore, in book form, entitled "Picturesque Mysore."

THE ADDRESS of Flatau, Dick and Co. has been changed to 9 Camomile Street, London, E.C.3, telephone No.: Avenue 1911 to 1916, owing to the expansion of business.

THE SPEECHES delivered at the dinner given in October to celebrate the one hundredth anniversary of the founding of Chance and Hunt, Ltd., have been published in the form of a souvenir brochure.

THE PRESIDENT OF BRAZIL has authorised a prize of $4,000 to be awarded to the inventor of a machine for the extraction of carnauba wax. Acceptance of the prize carries with it a waiver of private rights to the patent. Brazil is the only source of the material.

THE IMPORT DUTIES ADVISORY COMMITTEE has received an application for an increase in the import duties on bi-sodium and tri-sodium phosphates. Representations should be addressed in writing to the secretary, Import Duties Advisory Committee, Caxton House (West Block), Tothill Street, Westminster, London, S.W.1, not later than January 23.

WHEN REPAIRS WERE BEING CARRIED OUT on December 23 to the control board in connection with petrol manufacture at the Uphall works of Scottish Oils, Ltd., an explosion occurred, wrecking the whole department, the four men in charge of the control being injured. The outbreak was quickly subdued, but all the valuable instruments and fittings were destroyed.

APPROXIMATELY 26,100 APPLICATIONS FOR PATENTS on inventions were filed in 1935, as compared with 37,409 in 1934. Figures for several previous years are as follows:—36,117 in 1931, 37,052 in 1932, and 36,734 in 1933, the peak being 39,898 in 1929. The number of patents applied for has been regarded as an indication of the state of industry, but this is evidently not a sound view seeing that notwithstanding the continued improvement in trade during the year, fewer patents were applied for.

EARLY THIS YEAR two Campbeltown distilleries will resume operations. It has been officially announced that the Springbank Distillery of J. and A. Mitchell and Co. will commence a season's distilling. This work, which dates back to 1828, was, in the prosperous days of the industry (when 22 distilleries were at work in the town), one of the most important in Campbeltown, but has been idle since 1930. The Glen Scotia Distillery of Bloch Bros., is also resuming work shortly.

FOLLOWING EXTENSIVE EXPERIMENTATIONS and with official approval, a new fertiliser, known as "Nitrogen-Lime-Phosphate," has been introduced upon the German market. The new fertiliser contains around 16 per cent. nitrogen (one-half nitrate-nitrogen and one-half ammonia-nitrogen), around 16 per cent. phosphoric acid and in the advantageous citrate-soluble form similar to "Rhenania Phosphate," and a considerable quantity of lime, consisting in part of phosphate of lime and part silicate of lime, corresponding in carbonate of lime to around 35 per cent. lime.

SCOTTISH OILS, LTD., has decided to proceed immediately with the sinking of two shale mines at Drumshoreland and Broxburn, a short distance east of their Roman Camp crude works. As in the case of the new mines being opened by the company at West Calder and also in the Winchburgh district, the Broxburn project will not on its fulfilment result in the employment of more shale miners, but rather it will ensure continued work for the men presently employed at Newliston and No. 3 Roman Camp mines, in each of which the shale is being worked out.

THE FOLLOWING ARE LECTURES of chemical interest which are to be given at the Royal Institution before Easter, 1936:—February 21: V. H. Blackman, Sc.D., F.R.S., "Light and Temperature and the Reproduction of Plants." March 6: Sir William Bragg, O.M., F.R.S., "The Electric Properties of Crystals." March 20: Dr. Freundlich, "Structures and Forces in Colloidal Systems." Tuesdays, January 21, 28, February 4, 11: "Atomic Arrangement in Alloys," by Professor W. L. Bragg. Tuesdays, March 10, 17, 24, 31: "Drug-like Actions of Some Foods," by Edward Mellanby, F.R.S. Saturdays, March 14, 21, 28, April 4: "Recent Researches on Transmutation," by Lord Rutherford.

THE VIEW that although there were many proposals for the provision of smokeless fuel it was not likely that any single method would prevail was expressed by Mr. H. J. Hodsman, M.B.E., M.Sc., F.I.C., lecturer in gas chemistry at Leeds University, addressing members of the Northern Section of the Coke Oven Managers' Association at Newcastle on December 20. He described research work carried out by himself and Mr. D. G. Woolfenden, B.Sc., and said that different raw materials called for different treatment and yielded products which must vary in some way. Further, he contended that some would require appliances suitably designed for their consumption, and confessed that experiments carried out so far were inconclusive. The chairman of the section, Mr. N. L. Tyler, presided, and among others present was Mr. T. Westthorp, the national president.

THE INSTITUTE OF CHEMISTRY has issued, in booklet form, a lecture entitled "Food and the Consumer," which was delivered before the Bristol section on October 7 by Dr. G. W. Monier-Williams, F.I.C.

IN VIEW OF THE FALL in prices of Continental steel, British cast iron fittings for cast iron pipes and tubes are, for duty purposes, to be admitted into India either on a 10 per cent. *ad valorem* basis or on payment of a specific duty, whichever is the less.

THE SOCIETY OF THE CHEMICAL INDUSTRY is making a special appeal to those who have ceased membership during the past few years to rejoin in view of the fact that the Society is more active than at any time in its history and that further progress is only hampered by lack of funds and other forms of support.

A TEMPORARY OFFER of a wage increase, "without prejudice to either side," has been made by the Staveley Coal and Iron Co., Chesterfield, to the miners employed by them. According to the general manager, the offer was made as "a constructive proposal in the hope that it would lead to a final settlement."

AMONG THE CONTRIBUTIONS to the Liverpool Goodfellows Fund for providing Christmas parcels to the poor people of the city were: Shipping office staff of Imperial Chemical Industries, Ltd., £11 11s.; other staffs of Imperial Chemical Industries, £11 11s.; office and works staff of C. W. Field, Ltd., manufacturing and wholesale chemists, Liverpool, £9 4s. 10d.

PROPOSALS FOR THE MANUFACTURE OF TRANSPARENT PAPER were referred to by Mr. Percy A. J. Hammett, the chairman, at the annual meeting of the Branston Artificial Silk Co. Discussions for raising the necessary finance privately had been entered into, he said, but if negotiations were not concluded by the time when an industrial issue of that type might publicly be made with reasonable prospects of success, they would adopt that course.

THE BIRMINGHAM UNIVERSITY BUREAU of Research on Russian Economic Conditions has issued a memorandum on its investigations of new tendencies in Soviet economic policy, heavy industry and railway transport. It is the eleventh publication of the Bureau, which was formed in 1931 to promote interchange of views and co-operation amongst those engaged in a scientific study of economic and social conditions in the U.S.S.R. and to assist them in their research work.

ACCORDING TO AN AUTHORITATIVE BANGKOK SOURCE, Siam is unlikely to agree to renew the tin restriction scheme unless her basic quota is raised to 25,000 tons per annum. Siam's existing basic quota is 9,800 tons, but this increases proportionately as the international quota is raised over 65 per cent. At present, therefore, Siam has a permissible production of over 11,000 tons a year. Even if this increase in the quota was agreed upon, it is not certain whether the Siamese Government would again sign the agreement.

PRESIDING AT THE ANNUAL MEETING of Transparent Paper, Ltd., on December 31, the chairman, Lt.-Col. R. K. Morcom, referred to "the onslaught which had been made against the board," and said that he had practically carried the company for several years. If the opposition would form a syndicate to step into his shoes and take the responsibilities he was carrying, he would gladly vacate the chair. After some discussion, an amendment to reduce the number of directors to three was ruled out of order. The report and accounts were adopted.

A HOT-POT SUPPER AND CONCERT was given at Hill's Restaurant, Manchester, on Monday, to the employees of David Moseley and Sons, Ltd., who had served for 25 years and over. Mr. Rex Moseley and Mr. David Moseley were present, together with 102 employees who had qualified with this length of service. The firm was founded in 1833 and in one of the waiting rooms is a notice giving the names of 34 employees who have faithfully served the firm for over 50 years each. Ten of these people were at the concert, including Mrs. M. E. Humphrys, with 61 years' service, and Mr. W. Johnson, who will be 84 next month.

THE REPORT OF COAL AND ALLIED INDUSTRIES for the year to September 30 last points out that the fire which broke out in the company's Seaham Harbour plant on the night of December 13-14 has rendered it impossible to give any indication of yields to be expected from the company's carbonisation process. The fire, which occurred at a time when 49 ovens out of the whole battery of 51 ovens had been put into operation, has necessitated the closing down of the plant for repairs, after which the ovens will have to be relit. The cause of the damage was accidental and in no way due to the process.

PRELIMINARY FIGURES issued by the Department of Commerce of oil shipments from the United States to Italy during November disclose a striking increase in Italian purchases of petrol and fuel oil instead of crude oil. In November petrol shipments totalled 78,284 barrels, against none in September. Shipments of petrol and oil which could be used as primarily a naval fuel amounted to 58,214 barrels, compared with 22,822 barrels in October. At the same time exports of crude oil were 316,955 barrels, compared with 417,474 in October.

Weekly Prices of British Chemical Products

Review of Current Market Conditions

PRICES generally remain unchanged in the markets for general chemicals, rubber chemicals, wood distillation products, pharmaceutical and photographic chemicals, perfumery chemicals, essential oils and intermediates. A number of coal tar products have, however, been advanced during the week. Unless otherwise stated the prices below cover fair quantities net and naked at sellers' works.

LONDON.—Notwithstanding the holidays there has been a brisk demand for various chemicals. Whereas formic acid has been advanced by £2 per ton, acetic acid has been reduced; otherwise prices remain steady.

MANCHESTER.—Business conditions on the Manchester chemical market during the past week have continued under the influence of holiday and other year-end factors, including stocktaking operations, although the market has not been so lifeless as it was a week ago. Deliveries of chemicals against contracts have not yet resumed to any extent and conditions in this respect will not be back to normal before next week. In the meantime, the feeling among traders on 'Change here this week with regard to prospects over the new year, at all events, over the first three months, was fairly hopeful, and there is a pretty general belief that the improvement already recorded will be at least maintained. Price conditions so far as the heavy and light chemicals are concerned are mostly steady. The majority of the by-products are extremely firm, and pitch, tar, xylol, toluol, and solvent naphtha are again slightly dearer.

SCOTLAND.—On account of the holidays there has been a lull in the demand for general chemicals both for home trade and export. Prices, however, remain very steady at about previous figures with only slight changes to report.

Price Changes

General Chemicals.—ACETIC ACID, tech. 80%, £33 5s. to £35 5s.; pure 80%, £35 5s. to £37 5s.; tech. 40%, £17 16s. to £19 15s.; tech. 60%, £25 15s. to £27 15s.; tech. glacial (Manchester), £50; FORMIC ACID, £42 to £47 per ton.

Coal Tar Products.—CRESYLIC ACID, 99/100, 2s. to 2s. 8d. per gal.; pale 98%, 1s. 10d. to 1s. 11d.; dark, 1s. 6d. to 1s. 7d.; NAPHTHA, solvent, 95/160, 1s. 9d.; NAPHTHALENE, crude, whizzed or hot pressed, £12 15s. per ton.

Nitrogen Fertilisers.—SULPHATE OF AMMONIA, £7 2s. per ton.

All other prices remain unchanged.

General Chemicals

ACETONE.—LONDON: £62 to £65 per ton; SCOTLAND: £66 to £68 ex wharf, according to quantity.

ACID, ACETIC.—LONDON: Tech., 80%, £33 5s. to £35 5s. per ton; pure 80%, £35 5s. to £37 5s.; tech., 40%, £17 16s. to £19 15s.; tech., 60%, £25 15s. to £27 15s. SCOTLAND: Glacial 98/100%, £48 to £52; pure 80%, £39 5s.; tech., 80%, £38 5s., d/d buyers' premises Great Britain. MANCHESTER: 80%, commercial, £37 5s.; tech. glacial, £50.

ACID, BORIC.—Commercial granulated, £27 per ton; crystal, £28; powdered, £29; extra finely powdered, £31; packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. B.P. cryst., £36; B.P. powder, £37. SCOTLAND: Crystals, £28; powdered, £29.

ACID, CHROMIC.—10½d. per lb., less 2½%, d/d U.K.

ACID, CITRIC.—11½d. per lb. MANCHESTER: 1s. SCOTLAND: 11¾d.

ACID, CRESYLIC.—97/100%, 1s. 5d. to 1s. 6d. per gal.; 99/100%, refined, 1s. 9d. to 1s. 10d. per gal. LONDON: 98/100%, 1s. 5d. f.o.r.; dark, 1s.

ACID, FORMIC.—LONDON: £42 to £47 per ton.

ACID, HYDROCHLORIC.—Spot, 4s. to 6s. carboy d/d according to purity, strength and locality. SCOTLAND: Arsenical quality, 4s.; dearsenicated, 5s. ex works, full wagon loads.

ACID, LACTIC.—LANCASHIRE: Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £48; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £53; edible, 50% by vol., £41. One-ton lots ex works, barrels free.

ACID, NITRIC.—80° Tw. spot, £18 to £25 per ton makers' works. SCOTLAND: 80°, £24 ex station full truck loads.

ACID, OXALIC.—LONDON: £47 17s. 6d. to £57 10s. per ton, according to packages and position. SCOTLAND: 98/100%, £48 to £50 ex store. MANCHESTER: £49 to £54 ex store.

ACID, SULPHURIC.—SCOTLAND: 144° quality, £3 12s. 6d.; 168°, £7; dearsenicated, 20s. per ton extra.

ACID, TARTARIC.—1s. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. LONDON: 11¾d., less 5%. SCOTLAND: 1s. 0¼d. less 5%. MANCHESTER: 1s. per lb.

ALUM.—SCOTLAND: Lump potash, £8 10s. per ton ex store.

ALUMINA SULPHATE.—LONDON: £7 10s. to £8 per ton. SCOTLAND: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 10d. per lb. d/d in cylinders. SCOTLAND: 10d. to 1s. containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM BICHROMATE.—8d. per lb. d/d U.K.

AMMONIUM CARBONATE.—SCOTLAND: Lump, £30 per ton; powdered, £33, in 5-cwt. casks d/d buyers' premises U.K.

AMMONIUM CHLORIDE.—LONDON: Fine white crystals, £18 to £19. (See also Salammoniac.)

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

ANTIMONY OXIDE.—SCOTLAND: £61 to £65 per ton, c.i.f. U.K. ports.

ANTIMONY SULPHIDE.—Golden, 6½d. to 1s. 1d. per lb.; crimson, 1s. 5½d. to 1s. 7d. per lb., according to quality.

ARSENIC.—LONDON: £15 per ton c.i.f. main U.K. ports for imported material; Cornish nominal, £22 10s. f.o.r. mines. SCOTLAND: White powdered, £23 ex wharf. MANCHESTER: White powdered Cornish, £21 10s., ex store.

ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.

BARIUM CHLORIDE.—LONDON: £10 10s. per ton. SCOTLAND: £10 10s. to £10 15s.

BARYTES.—£6 10s. to £8 per ton.

BISULPHITE OF LIME.—£6 10s. per ton f.o.r. London.

BLEACHING POWDER.—Spot, 35/37%, £7 19s. per ton d/d station in casks, special terms for contract. SCOTLAND: £9 5s.

BORAX, COMMERCIAL.—Granulated, £14 10s. per ton; crystal, £15 10s.; powdered, £16; finely powdered, £17; packed in 1-cwt. bags, carriage paid home to buyer's premises within the United Kingdom in 1-ton lots.

CADMIUM SULPHIDE.—4s. 10d. to 5s. 1d. per lb.

CALCIUM CHLORIDE.—Solid 70/75% spot, £5 5s. per ton d/d station in drums.

CARBON BISULPHIDE.—£31 to £33 per ton, drums extra.

CARBON BLACK.—3¾d. to 4¼d. per lb. LONDON: 4½d. to 5d.

CARBON TETRACHLORIDE.—SCOTLAND: £41 to £43 per ton, drums extra.

CHROMIUM OXIDE.—10¾d. per lb., according to quantity d/d U.K.; green, 1s. 2d. per lb.

CHROMETAN.—Crystals, 3¼d. per lb.; liquor, £19 10s. per ton d/d.

COPPERAS (GREEN).—SCOTLAND: £3 15s. per ton, f.o.r. or ex works.

CREAM OF TARTAR.—£3 19s. per cwt. less 2½%. LONDON: £3 17s. per cwt. SCOTLAND: £3 16s. 6d. net.

DINITROTOLUENE.—66/68° C., 9d. per lb.

DIPHENYLGUANIDINE.—2s. 2d. per lb.

FORMALDEHYDE.—LONDON: £24 10s. per ton. SCOTLAND: 40%, £25 to £28 ex store.

IODINE.—Resublimed B.P., 6s. 3d. to 8s. 4d. per lb.

LAMPBLACK.—£45 to £48 per ton.

LEAD ACETATE.—LONDON: White, £36 10s. per ton; brown, £1 per ton less. SCOTLAND: White crystals, £34 to £35; brown, £1 per ton less. MANCHESTER: White, £36 10s.; brown, £34 10s.

LEAD NITRATE.—£32 10s. to £34 10s. per ton.

LEAD, RED.—SCOTLAND: £25 to £27 per ton less 2½%; d/d buyer's works.

LEAD, WHITE.—SCOTLAND: £39 per ton, carriage paid. LONDON: £42 10s.

LITHOPONE.—30%, £16 10s. to £17 per ton.

MAGNESITE.—SCOTLAND: Ground calcined, £9 per ton, ex store.

MAGNESIUM CHLORIDE.—SCOTLAND: £7 per ton.

MAGNESIUM SULPHATE.—Commercial, £5 per ton, ex wharf.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

PHENOL.—6¾d. to 7¼d. per lb. to June 30, 1936.

POTASH, CAUSTIC.—LONDON: £42 per ton. MANCHESTER: £39.

POTASSIUM BICHROMATE.—Crystals and Granular, 5d. per lb. less 5%; d/d U.K. Ground, 5¼d. LONDON: 5d. per lb. less 5%, with discounts for contracts. SCOTLAND: 5d. d/d U.K. or c.i.f. Irish Ports. MANCHESTER: 5d.

POTASSIUM CHLORATE.—LONDON: £37 to £40 per ton. SCOTLAND: 99¾/100%, powder, £37. MANCHESTER: £38.

POTASSIUM CHROMATE.—6¼d. per lb. d/d U.K.

POTASSIUM IODIDE.—B.P., 5s. 2d. per lb.

POTASSIUM NITRATE.—SCOTLAND: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 8¾d. per lb. SCOTLAND: B.P. crystals, 10d. to 10½d. MANCHESTER: B.P., 11¾d. to 1s.

POTASSIUM PRUSSIATE.—LONDON: Yellow, 8½d. to 8¾d. per lb. SCOTLAND: Yellow spot, 8¾d. ex store. MANCHESTER: Yellow, 8¾d.

SALAMMONIAC.—First lump spot, £41 17s. 6d. per ton d/d in barrels. SCOTLAND: Large crystals, in casks, £36.

SODA ASH.—58% spot, £5 12s. 6d. per ton f.o.r. in bags.

SODA, CAUSTIC.—Solid, 76/77° spot, £13 17s. 6d. per ton d/d station. SCOTLAND: Powdered 98/99%, £17 10s. in drums, £18 5s. in casks, Solid 76/77°, £14 12s. 6d. in drums; 70/73%, £14 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts 10s. per ton less. MANCHESTER: £13 5s. to £14 contracts.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE.—LONDON: £21 10s. SCOTLAND £20 15s.

SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/u station in bags. SCOTLAND: Refined recrystallised £10 15s. ex quay or station. MANCHESTER: £10 10s.

SODIUM BICHROMATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount 5%. Anhydrous, 5d. per lb. LONDON: 4d. per lb. less 5% for spot lots and 4d. per lb. with discounts for contract quantities. MANCHESTER: 4d. per lb. basis. SCOTLAND: 4d. delivered buyer's premises with concession for contracts.

SODIUM BISULPHITE POWDER.—60/62%, £20 per ton d/d 1 cwt. iron drums for home trade.

SODIUM CARBONATE, MONOHYDRATE.—£15 per ton d/d in minimum ton lots in 2 cwt. free bags. Soda crystals, SCOTLAND: £5 to £5 5s. per ton ex quay or station. Powdered or pea quality, 7s. 6d. per ton extra. Light Soda Ash, £7 ex quay, min. 4-ton lots with reductions for contracts.

SODIUM CHLORATE.—£32 10s. per ton. SCOTLAND: 3¾d. per lb.

SODIUM CHROMATE.—4d. per lb. d/d U.K.

SODIUM HYPOSULPHITE.—SCOTLAND: Large crystals English manufacture, £9 5s. per ton ex stations, min. 4-ton lots. Pea crystals, £14 10s. ex station, 4-ton lots. MANCHESTER: Commercial, £10 5s.; photographic, £14 10s.

SODIUM META SILICATE.—£14 per ton, d/d U.K. in cwt. bags.

SODIUM IODIDE.—B.P., 6s. per lb.

SODIUM NITRITE.—LONDON: Spot, £18 5s. to £20 5s. per ton d/d station in drums.

SODIUM PERBORATE.—10%, 9¼d. per lb. d/d in 1-cwt. drums. LONDON: 10d. per lb.

SODIUM PHOSPHATE.—£13 per ton.

SODIUM PRUSSIATE.—LONDON: 5d. to 5½d. per lb. SCOTLAND: 5d. to 5¾d. ex store. MANCHESTER: 5d. to 5½d.

SODIUM SILICATE.—140° Tw. Spot, £8 per ton. SCOTLAND: £8 10s.

SODIUM SULPHATE (GLAUBER SALTS).—£4 2s. 6d. per ton d/d SCOTLAND: English material, £3 15s.

SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 12s. 6d. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 5s.

SODIUM SULPHIDE.—Solid 60/62% Spot, £10 15s. per ton d/d in drums; crystals 30/32%, £8 per ton d/d in casks. SCOTLAND: For home consumption, Solid 60/62%, £10 5s.; broken 60/62%, £11 5s.; crystals, 30/32%, £8 7s. 6d., d/d buyer's works on contract, min. 4-ton lots. Spot solid, 5s. per ton extra. Crystals, 2s. 6d. per ton extra. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8 2s. 6d.

SODIUM SULPHITE.—Pea crystals, spot, £13 10s. per ton d/d station in kegs. Commercial spot, £8 15s. d/d station in bags.

SULPHUR.—£9 10s. to £9 15s. per ton. SCOTLAND: £8 to £9.

SULPHATE OF COPPER.—MANCHESTER: £14 17s. 6d. to £16 per ton f.o.b.

SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quality.

SULPHUR PRECIP.—B.P., £55 to £60 per ton according to quantity. Commercial, £50 to £55.

VERMILION.—Pale or deep, 5s. 1d. per lb. in 1-cwt. lots.

ZINC CHLORIDE.—SCOTLAND: British material, 98%, £18 10s. per ton f.o.b. U.K. ports.

ZINZ SULPHATE.—LONDON: £12 per ton. SCOTLAND: £10 10s.

ZINC SULPHIDE.—10d. to 11d. per lb.

Coal Tar Products

ACID, CRESYLIC.—90/100%, 2s. to 2s. 8d. per gal., according to specification; pale 98%, 1s. 10d. to 1s. 11d.; dark, 1s. 6d. to 1s. 7d. LONDON: 98/100%, 1s. 4d.; dark, 95/97%, 1s. SCOTLAND: Pale, 99/100%, 1s. 3d. to 1s. 4d.; dark, 97/99%, 1s. to 1s 1d.; high boiling acid, 2s. 6d. to 3s.

ACID, CARBOLIC.—Crystals, 6¾d. to 7¼d. per lb.; crude, 60's, 1s. 11½d. to 2s. 2½d. per gal. MANCHESTER: Crystals, 7¼d. to 7¾d. per lb.; crude, 2s. 5d. per gal. SCOTLAND: 60's, 2s. 5d. to 2s. 7d.

BENZOL.—At works, crude, 9½d. to 10d. per gal.; standard motor 1s. 3d. to 1s. 3½d.; 90%, 1s. 4d. to 1s. 4½d.; pure, 1s. 7½d. to 1s. 8d. LONDON: Motor, 1s. 3½d. SCOTLAND: Motor, 1s. 6½d.

CREOSOTE.—B.S.I. Specification standard, 5¼d. per gal. f.o.r. Home, 3¾d. d/d. LONDON: 4½d. f.o.r. North; 5d. London. MANCHESTER: 5½d. SCOTLAND: Specification oils, 4d.; washed oil, 4¼d. to 4¼d.; light, 4½d.; heavy, 4¼d. to 4½d.

NAPHTHA.—Solvent, 90/100%, 1s. 5½d. to 1s. 6½d. per gal.; 95/160%, 1s. 9d.; 90%, 11d. to 1s. 1d. LONDON: Solvent, 1s. 3½d. to 1s. 4d.; heavy, 11d. to 1s. 0½d. f.o.r. SCOTLAND: 90/160%, 1s. 3d. to 1s. 3½d.; 90/190%, 11d. to 1s. 2d.

NAPHTHALENE.—Crude, whizzed or hot pressed, £12 15s. per ton; purified crystals, £15 5s. per ton in 2-cwt. bags. LONDON: Fire lighter quality, £3 to £3 10s.; 74/76 quality, £4 to £4 10s.; 76/78 quality, £5 10s. to £6. SCOTLAND: 40s. to 50s.; whizzed, 70s. to 75s.

PYRIDINE.—90/140%, 5s. 6d. to 8s. per gal.; 90/180, 2s. 3d.

TOLUOL.—90%, 2s. 3d. to 2s. 4d. per gal.; pure, 2s. 6d. to 2s. 7d.

XYLOL.—Commercial, 2s. 3d. per gal.; pure, 2s. 4d.

PITCH.—Medium, soft, 35s. to 36s. per ton, in bulk at makers' works.

Intermediates and Dyes

ACID, BENZOIC, 1914 B.P. (ex Toluol).—1s. 9¼d. per lb.

ACID, GAMMA.—Spot, 4s. per lb. 100% d/d buyer's works.

ACID, H.—Spot, 2s. 4½d. per lb. 100% d/d buyer's works.

ACID NAPHTHIONIC.—1s. 8d. per lb.

ACID, NEVILLE AND WINTHER.—Spot, 3s. per lb. 100%.

ACID, SULPHANILIC.—Spot, 8d. per lb. 100%, d/d buyer's works.

ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.

ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.

BENZALDEHYDE.—Spot, 1s. 8d. per lb., packages extra.

BENZIDINE BASE.—Spot, 2s. 5d. per lb., 100% d/d buyer's works.

BENZIDINE HCL.—2s. 5d. per lb.

p-CRESOL 34-5° C.—1s. 9d. per lb. in ton lots.

m-CRESOL 98/100%.—1s. 11d. per lb. in ton lots.

DICHLORANILINE.—1s. 11½d. to 2s. 3d. per lb.

DIMETHYLANILINE.—Spot, 1s. 6d. per lb., package extra.

DINITROBENZENE.—8d. per lb.

DINITROTOLUENE.—48/50° C., 9d. per lb.; 66/68° C., 10½d.

DINITROCHLOREENZENE, SOLID.—£72 per ton.

DIPHENYLAMINE.—Spot, 2s. per lb., d/d buyer's works.

α-NAPHTHOL.—Spot, 2s. 4d. per lb., d/d buyer's works.

β-NAPHTHOL.—Spot, £78 15s. per ton, in paper bags.

α-NAPHTHYLAMINE.—Spot, 11½d. per ton., d/d buyer's works.

β-NAPHTHYLAMINE.—Spot, 2s. 9d. per lb., d/d buyer's works.

o-NITRANILINE.—3s. 11d. per lb.

m-NITRANILINE.—Spot, 2s. 7d. per lb., d/d buyer's works.

p-NITRANILINE.—Spot, 1s. 8d. per lb., d/d buyer's works.

NITROBENZENE.—Spot, 4½d. to 5d. per lb.; 5-cwt. lots, drums extra.

NITRONAPHTHALENE.—10d. per lb.; P.G., 1s. 0½d. per lb.

SODIUM NAPHTHIONATE.—Spot, 1s. 9d. per lb.

o-TOLUIDINE.—9½d. to 11d. per lb.

p-TOLUIDINE.—1s. 11d. per lb.

Nitrogen Fertilisers

SULPHATE OF AMMONIA.—The prices have been announced for the remainder of the fertiliser year 1935/36 as follows: January, £7 2s. per ton; February, £7 3s. 6d.; March to June, £7 5s., for neltral quality basis 20.6% nitrogen delivered in 6-ton lots to farmer's nearest station.

CALCIUM CYANAMIDE.—Prices for the remainder of the fertiliser year 1935/36 are: January £7 1s. 3d., February £7 2s. 6d., March £7 3s. 9d., April/June, £7 5s., delivered in 4-ton lots.

NITRO-CHALK.—The price for the 1935/36 season is £7 5s. per ton delivered in 6-ton lots to farmer's nearest station—all terms and conditions the same as for the season 1934/35.

NITRATE OF SODA.—The price for the 1935/36 season is £7 12s. 6d. per ton delivered in 6-ton lots to farmer's nearest station—all terms and conditions the same as for the season 1934/35.

CONCENTRATED COMPLETE FERTILISERS.—£10 10s. to £10 19s. per ton according to analysis, delivered in 6-ton lots to farmer's nearest station.

AMMONIUM PHOSPHATE (N.P.) FERTILISERS.—£10 5s. to £13 15s. per ton according to analysis, delivered in 6-ton lots to farmer's nearest station.

Oil Prices

LONDON, December 31.—LINSEED OIL was firm. Spot, £29 5s. (small quantities), Jan., £26 17s. 6d.; Jan.-April, £27 2s. 6d.; May-Aug., £27 15s.; Sept.-Dec., £28 2s. 6d., naked. RAPE OIL was slow. Crude extracted, £35 10s.; technical refined, £37, naked, ex wharf. COTTON OIL was steady. Egyptian crude, £26; refined common edible, £29 10s.; deodorised, £31 10s., naked, ex mill (small lots £1 10s. extra). TURPENTINE was easier. American, spot, 45s. 6d. per cwt.

HULL, Jan. 1.—LINSEED OIL.—Spot quoted £28 per ton; Jan.-April, £27 15s.; May-Aug., £27 17s. 6d. COTTON OIL.—Egyptian, crude, spot, £26 10s. per ton; edible, refined, spot, £29; technical, spot, £29; deodorised, £31, naked. PALM KERNEL OIL.—Crude, f.m.q., spot, £24 10s. per ton, naked. GROUNDNUT OIL.—Extracted, spot, £32 per ton; deodorised, £35. RAPE OIL.—Extracted, spot, £34 10s. per ton; refined, £36. SOYA OIL.—Extracted, spot, £28 per ton; deodorised, £31. COD OIL.—F.o.r. or f.a.s., 25s. per cwt. in barrels. CASTOR OIL.—Pharmaceutical, 43s. 6d. per cwt.; first, 38s. 6d.; second, 36s. 6d. TURPENTINE.—American, spot, 47s. per cwt.

Chemical and Allied Stocks and Shares

Encouraging Outlook for 1936

THE further reduction in the unemployment figures and the encouraging views expressed by leading trade authorities as to the outlook for 1936 have tended to influence sentiment in the industrial section of the Stock Exchange this week. Shares of chemical and kindred companies are reported to have been more active, and with few exceptions share values have not moved against holders. Fison, Packard & Prentice continued active and held up well around 45s. Although a larger capital ranks for dividend in respect of the current financial year, the market expects considerable benefits from the expansion of the business, and there are said to be possibilities of a further increase in dividend. The price of Cooper, McDougall & Robertson has now been adjusted to the dealings at higher prices and is 40s. at the time of writing. A point of interest was more activity in Lawes' Chemical 10s. shares than for some time. On the basis of last year's increased dividend of 5 per cent. the yield works out at 7 per cent. British Glues have gone back moderately to 7s. 6d., but at the time of writing the price does not seem to have been tested by much business. B. Laporte came in for increased business and kept around 115s. Salt Union were very firm, and Unilever were better. Imperial Chemical also held up well. Now that permission of the court has been obtained, the deferred shares are to be consolidated into ordinary shares on the basis of one ordinary for every four deferred. Now that the company's capital structure will be simplified by the removal of the deferred shares with their somewhat complicated dividend rights, it is being pointed out that should additional capital be required in the future it would be much easier than formerly to offer additional shares to shareholders on favourable terms should such a course be decided upon. United Premier Oil & Cake remained active under the influence of dividend estimates. British Oil and Cake Mills preferred ordinary transferred at rather higher prices. United Molasses continued to benefit from further consideration of the statements at the meeting and have moved up at the time of writing. Distillers are little changed on balance for the week. The interim dividend falls to be declared shortly. There is not generally expected to be an increase, it being assumed that all question of the latter will probably be left until the final payment when the provisions of the Budget will be known. Triplex Safety Glass were bought on the statement of the managing director that there are anticipations of larger demand for safety glass in 1936. Improvement was shown in Pinchin Johnson on hopes of a larger final dividend being declared in March. Bradford Dyers were better. British Oxygen came in for active business on the expectations of a bonus this year. The latter has been foreshadowed as possible in celebration of the company's fiftieth anniversary, but the announcement is not generally expected in the market until the results for the year are issued in May. Consett Iron shares came in for larger demand, partly on the broadening of the basis of the company's business, but largely owing to anticipations that this year there may be rearrangement of the capital to permit of regular dividends in the future. Rayon shares were firmer, having continued to benefit from the removal of uncertainty as to the silk duties. British Celanese issues were bought on the belief that another payment in respect of first preference dividend arrears may be announced this month and Courtaulds on the increase in rayon prices announced by the Viscose Co., its American associate.

Name.	Dec. 31.	Dec. 17.
Anglo-Iranian Oil Co., Ltd. Ord.	68/9	68/1½
,, 8% Cum. Pref.	36/-	36/-
,, 9% Cum. Pref.	37/-	37/-
Associated Dyers and Cleaners, Ltd. Ord.	2/6	2/6
,, 6½% Cum. Pref.	5/6¾	5/6¾
Associated Portland Cement Manufacturers, Ltd. Ord.	65/-	64/6
,, 5½% Cum. Pref.	28/-	28/-
Benzol & By-Products, Ltd. 6% Cum. Part Pref.	2/6	2/6
Berger (Lewis) & Sons, Ltd. Ord.	66/3	65/7½
Bleachers' Association, Ltd. Ord.	7/6	6/3
,, 5½% Cum. Pref.	10/7½	10/7½
Boake, A., Roberts & Co., Ltd. 5% Pref. (Cum.)	20/-	20/-
Boots Pure Drug Co., Ltd. Ord. (5/-)	49/6	49/6
Borax Consolidated, Ltd. Pfd. Ord. (£)	104/-	101/3
,, Defd. Ord.	21/3	19/-
,, 5½% Cum. Pref. (£10)	£11/10/-	£11/5/-
,, 4½% Deb. (1st Mort.) Red. (£100)	£107	£107
,, 4½% 2nd Mort. Deb. Red. (£100)	£102/10/-	£102
Bradford Dyers' Association, Ltd. Ord.	10/-	10/-
,, 5% Cum. Pref.	13/1½	12/6
,, 4% 1st Mort. Perp. Deb. (£100)	£87	£87
British Celanese, Ltd. 7% 1st Cum. Pfd.	25/6	25/6
,, 7½% Part. 2nd Cum. Pref.	23/-	23/-
British Cotton & Wool Dyers' Association Ltd. Ord. (5/-)	6/3	6/3
,, 4% 1st Mort. Deb. Red. (£100)	£94	£92
British Cyanide Co., Ltd. Ord. (2/-)	3/1½	3/1½
British Drug Houses, Ltd. Ord.	17/6	18/9
,, 5% Cum. Pref.	21/3	21/3
British Glues and Chemicals, Ltd. Ord. (4/-)	7/6	8/1½
,, 8% Pref. (Cum. and Part.)	28/9	28/1½
British Oil and Cake Mills, Ltd. Cum. Pfd. Ord.	48/9	48/9
,, 5½% Cum. Pref.	26/3	26/3
,, 4½% First Mort. Deb. Red. (£100)	£107/10/-	£107/10/-
British Oxygen Co., Ltd. Ord.	111/3	115/-
,, 6½% Cum. Pref.	32/6	32/6
British Portland Cement Manufacturers, Ltd. Ord.	85/-	85/-
,, 6% Cum. Pref.	30/6	30/6
Bryant & May, Ltd. Pref.	66/3	66/3
Burt, Boulton & Haywood, Ltd. Ord.	20/-	20/-
,, 7% Cum. Pref.	27/6	27/6
,, 6% 1st Mort. Deb. Red. (£100)	£102/10/-	£105/10/-
Bush, W. J., & Co., Ltd. 5% Cum. Pref. (£5)	112/6	112/6
,, 4% 1st Mort. Deb. Red. (£100)	£96/10/-	£96/10/-
Calico Printers' Association, Ltd. Ord.	8/9	8/9
,, 5% Pref. (Cum.)	15/-	15/-
Cellulose Acetate Silk Co., Ltd. Ord.	12/9½	12/9½
,, Deferred (1/-)	2/1½	2/1½

Name.	Dec. 31.	Dec. 17.
Consett Iron Co., Ltd. Ord.	11/3	10/3
,, 8% Pref.	30/-	30/-
,, 6% First Deb. stock, Red. (£100)	£107	£107
Cooper, McDougal & Robertson, Ltd. Ord.	28/9	37/6
,, 7% Cum. Pref.	30/-	30/-
Courtaulds, Ltd. Ord.	58/9	56/3
,, 5% Cum.	26/3	26/3
Crosfield, Joseph, & Sons, Ltd. 5% Cum. Pre Pref.	25/-	25/-
,, Cum. 6% Pref.	28/9	28/9
,, 6½% Cum. Pref.	31/10½	30/7½
,, 7½% "A" Cum. Pref.	30/7½	30/7½
Distillers Co., Ltd. Ord.	97/6	97/-
,, 6% Pref. Stock Cum.	31/6	31/6
Dorman Long & Co., Ltd. Ord.	21/3	21/6
,, Pref. Ord.	30/-	29/4½
,, 6½% Non-Cum. 1st Pref.	22/9	23/-
,, 8% Non-Cum. 2nd Pref.	23/6	23/-
,, 4% First Mort. Perp. Deb. (£100)	£101/10/-	£101/10/-
,, 5% 1st Mort. Red. Deb. (£100)	£106/10/-	£107/10/-
English Velvet & Cord Dyers' Association, Ltd. Ord.	5/-	5/-
,, 5% Cum. Pref.	8/9	8/9
,, 4% First Mort. Deb. Red. (£100)	£72/10/-	£72/10/-
Fison, Packard & Prentice, Ltd. Ord.	45/-	45/-
,, 7% Non-Cum. Pref.	31/3	31/3
,, 4½% Debs. (Reg.) Red. (£100)	£106	£106
Gas Light & Coke Co. Ord.	27/6	27/6
,, 3½% Maximum Stock (£100)	£89/10/-	£89/10/-
,, 4% Consolidated Pref. Stock (£100)	£107/10/-	£107/10/-
,, 3% Consolidated Deb. Stock, Irred. (£100)	£90	£90
,, 5% Deb. Stock Red. (£100)	£116/10/-	£116/10/-
,, 4½% Red. Deb. Stock (1960-65) (£100)	£112/10/-	£112/10/-
Goodlass Wall & Lead Industries, Ltd. Ord. (10/-)	14/4½	14/4½
,, 7% Prefd. Ord. (10/-)	13/9	13/9
,, 7% Cum. Pref.	28/9	28/6
Gossage, William, & Sons, Ltd. 5% 1st Cum. Pref.	24/4½	24/4½
,, 6½% Cum. Pref.	28/9	28/9
Imperial Chemical Industries, Ltd. Ord.	37/-	37/-
,, Deferred (10/-)	9/1½	9/-
,, 7% Cum. Pref.	34/-	33/6
Imperial Smelting Corporation, Ltd. Ord.	15/-	15/3
,, 6½% Pref. (Cum.)	24/3	24/3
International Nickel Co. of Canada, Ltd. Cum.	$46½	$43
Johnson, Matthey & Co., Ltd. 5% Cum. Pref. (£5)	105/-	108/-
,, 4% Mort. Deb. Red. (£100)	£98/10/-	£98/10/-
Laporte, B., Ltd. Ord.	115/-	115/-

Name.	Dec. 31.	Dec. 17.
Lawes Chemical Co., Ltd. Ord. (1/-)	6/3	6/3
,, 7% Non-Cum. Part Pref. (10/-)	10/-	10/-
Lever Bros., Ltd. 7% Cum. Pref.	32/3	32/-
,, 8% Cum. "A" Pref.	33/-	33/6
,, 20% Cum. Prefd. Ord.	68/9	77/6
,, 5% Cons. Deb. (£100)	£106/10/-	£106/10/-
,, 4% Cons. Deb. (£100)	£105/10/-	£105/10/-
Magadi Soda Co., Ltd. 12½% Pref. Ord. (5/-)	1/3	1/3
,, 6% 2nd Pref. (5/-)	6d.	6d.
,, 6% 1st Debs. (Reg.)	£10	£12
Major & Co., Ltd. Ord. (5/-)	7½d.	7½d.
,, 8% Part. Prefd. Ord. (10/-)	9d.	9d.
,, 7½% Cum. Pref.	1/6¾	1/6¾
Pinchin, Johnson & Co., Ltd. Ord. (10/-)	43/-	42/-
,, 1st Pref. 6½% Cum.	32/-	32/-
Potash Syndicate of Germany (Deutsches Kalisyndikat G.m.b.H.) 7% Gld. Ln. Sr. "A" and "B" Rd.	£70	£70
Reckitt & Sons, Ltd. Ord.	115/7½	115/7½
,, 4½% Cum. 1st Pref.	24/4½	24/4½

Name.	Dec. 31.	Dec. 17.
Salt Union, Ltd. Ord.	43/9	43/9
,, Pref.	45/-	45/-
,, 4½% Deb. (£100)	£107/10/-	£107/10/-
South Metropolitan Gas Co. Ord. (£100)	£133/10/-	£133/10/-
,, 6% Irred. Pref. (£100)	£149/10/-	£149/10/-
,, 4% Pref. (Irred.) (£100)	£107	£107
,, Perpetual 3% Deb. (£100)	£88/10/-	£88/10/-
,, 5% Red. Deb. 1950-60 (£100)	£116/10/-	£116/10/-
Staveley Coal and Iron Co., Ltd. Ord.	47/6	47/6
Stevenson & Howell, Ltd. 6½% Cum. Pref.	26/3	26/3
Triplex Safety Glass Co., Ltd. Ord. (10/-)	89/4½	82/6
Unilevers, tLd. Ord.	29/4½	29/4½
,, 7% Cum. Pref.	30/3	30/3
United Glass Bottle Manufacturers, Ltd. Ord.	41/-	41/6
,, 7½% Cum. Pref.	32/6	32/6
United Molasses Co., Ltd. Ord. (6/8)	21/3	21/3
,, 6% Cum. Pref.	25/-	25/-
United Premier Oil & Cake Co., Ltd. Ord. (5/-)	10/9	10/9
,, 7% Cum. Pref.	25/-	25/-
,, 4¾% Deb. Red. (£100)	£101/10/-	£101/10/-

Inventions in the Chemical Industry

Patent Specifications and Applications

THE following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Specifications Open to Public Inspection

ALIPHATIC ACIDS, purification.—Carbide and Carbon Chemicals Corporation. June 13, 1934. 14442/35.

SOLVENT-REFINING OF MINERAL OIL.—Texaco Development Corporation. June 14, 1934. 14527/35.

PRODUCTION OF VALUABLE HYDROCARBONS by treatment with hydrogenating gases of distillable carbonaceous materials, process. International Hydrogenation Patents Co., Ltd. June 14, 1934. 14593/35.

SHEET MATERIALS, manufacture.—British Celanese, Ltd. June 12, 1934. 16925/35.

SACCHARATES, manufacture.—Carboxhyd A.-G. June 14, 1934. 16938/35.

LUBRICATING OILS.—E. I. du Pont de Nemours and Co. June 15, 1934. 16978/35.

PRODUCING HYDROGEN PEROXIDE, process.—Elektrochemische Werke Munchen A.-G. June 16, 1934. 17214/35.

OBTAINING RARE GASES, method and apparatus.—I. G. Farbenindustrie. June 16, 1934. 17396/35.

Specifications Accepted with Date of Application

CONVERTING ALKALI SALTS of phenylalkyl barbituric acids into stable calcium compounds, process.—R. Grüter. March 5, 1934. 439,539.

AMINES, manufacture and production.—Coutts and Co., and F. Johnson (I. G. Farbenindustrie). May 15, 1934. 439,274.

BROMINATION PRODUCTS of vat dyestuffs, manufacture.—Soc. of Chemical Industry in Basle. May 19, 1934. 439,406.

VAT DYESTUFFS, manufacture.—Soc. of Chemical Industry in Basle. June 5, 1934. 439,279.

RECOVERING SULPHUR from gases containing sulphur dioxide, process.—Lodge-Cottrell, Ltd. (Siemens-Lurgi-Cottrell-Elektrofilter-Ges. für Forschung und Patentverwertung). June 14, 1935. 439,467.

ACID AND METAL REACTION PROCESS and product.—S. M. Burton. March 13, 1934. 439,735.

IMPROVING MINERAL LUBRICATING OIL, process.—Coutts and Co. and F. Johnson (I. G. Farbenindustrie). April 3, 1934. 439,621.

WATER GAS, method of manufacturing.—H. J. Carson. April 4, 1934. 439,562.

NITRONAPHTHYLAMINES, manufacture.—Imperial Chemical Industries, Ltd., and H. H. Hodgson. May 11, 1934. 439,632.

VAT DYESTUFFS, manufacture.—A. Carpmael (I. G. Farbenindustrie). June 1, 1934. 439,570.

AZO DYESTUFFS, manufacture and production.—Coutts and Co. and F. Johnson (I. G. Farbenindustrie). June 2, 1934. 439,680.

SUBSTITUTED ACID AMIDES, manufacture.—I. G. Farbenindustrie. June 13, 1933. 439,807.

AZO DYESTUFFS, manufacture and production.—Coutts and Co. and F. Johnson (I. G. Farbenindustrie). June 14, 1934. 439,811.

ACID TRIPHENYLMETHANE DYESTUFFS, manufacture.—I. G. Farbenindustrie. June 15, 1933. 439,815.

ILLUMINATING GAS, rich in hydrogen, and practically free from carbon monoxide, from solid fuels, obtaining.—Gas für Linde's Eismaschinen A.-G. June 24, 1933. 439,832.

AMMONIUM SALTS from their mixtures with other salts, separation.—Soc. D'Etudes Pour la Fabrication et L'Emploi des Engrais Chimiques. Jan. 13, 1934. 439,583.

CONCENTRATED LOWER ALIPHATIC ACIDS, production.—British Celanese, Ltd. Oct. 31, 1933. 439,764.

CYCLIC AMINES, manufacture.—Soc. of Chemical Industry in Basle. Nov. 25, 1933. 439,722.

SIMULTANEOUSLY WASHING LIGHT HYDROCARBONS and naphthalene out of gases.—Naamlooze Vennootschap Machinerieen-en Apparaten Fabrieken Meaf. June 22, 1934. 439,772.

IMPROVING MINERAL LUBRICATING OILS, process.—Coutts and Co. and F. Johnson (I. G. Farbenindustrie). April 3, 1934. 439,674.

Applications for Patents

(December 5 to 12 inclusive.)

COMPOUNDS of the azaphenanthrene series, manufacture.—G. W. Johnson (I. G. Farbenindustrie). 33743.

VAT DYESTUFFS of the anthraquinone series, manufacture.—G. W. Johnson (I. G. Farbenindustrie). 33859.

COMPOUNDS of the anthraquinone series, manufacture.—G. W. Johnson (I. G. Farbenindustrie). 33860.

CARRYING OUT CATALYTIC REACTIONS.—G. W. Johnson (I. G. Farbenindustrie). 34161.

COAL, ETC., CARBONACEOUS SUBSTANCES, distillation.—F. W. Salisbury-Jones and R. Nisbet. 33996.

ELEMENTARY SULPHUR, production.—Metallges A.-G. (Germany, July 10.) 34327.

MOULDED POLYMERISATION PRODUCTS, manufacture.—Röhm and Haas A.-G. (Germany, Dec. 6, '34.) 33887.

DIHYDROFOLLICLE HORMONE, manufacture.—Schering-Kahlbaum A.-G. (Germany, Dec. 11, '34.) 34224.

SATURATED HYDROCARBONS, dehydrogenation.—Usines de Mille. (France, Dec. 27, '34.) 34088.

(December 12 to 18 inclusive.)

HYDROGEN PEROXIDE, manufacture.—E. Berl. 34581.

CONTROLLING CALORIFIC VALUE of gas mixtures, apparatus.—W. F. Blakeley. 34436.

2 : 4 : 6-TRIAMINO-1 : 3 : 5-TRIAZINE, manufacture. — A. G. Bloxam (Soc. of Chemical Industry in Basle). 35010.

OXYKETONES or their derivatives, manufacture.—A. G. Bloxam (Soc. of Chemical Industry in Basle). 35117.

PHOSPHATES, manufacture.—Briton Ferry Chemical and Manure Co., Ltd. 34897, 34898.

SEPARATING VOLATILE ACIDS from combination with metallic bases, method.—Briton Ferry Chemical and Manure Co., Ltd. 34899.

ANTIMONY OXIDE, production.—E. L. W. Byrne (American Smelting and Refining Co.). 34643.

ACTIVATING MERCURY used for recovering gold, etc., apparatus. J. M. Cadigan and C. C. Farr. (New Zealand, Feb. 8.) 34593.

REDUCTION OF METAL SULPHIDES, means.—Calloy, Ltd., and G. N. Kirshbom. 35121.

OXYGENATED ALIPHATIC COMPOUNDS derived from 2-ethylbutyraldehyde.—Carbide and Carbon Chemicals Corporation. (United States, Dec. 18, '34.) 35068.

Forthcoming Events

LONDON

Jan. 6.—Society of Chemical Industry (London Section). Joint meeting with the Road and Building Materials Group. 8 p.m. Burlington House, Piccadilly, London.

Jan. 7, 8 and 9.—26th Annual Exhibition of Scientific Instruments and Apparatus. Imperial College of Science and Technology, Imperial Institute Road, South Kensington, London.

Jan. 7.—Society of Glass Technology. Annual dinner. 7 p.m. Trocadero Restaurant, London.

Jan. 8.—"Organic Glasses." Professor G. T. Morgan, N. J. L. Megson and L. E. Holmes. "Plastics for Laminated Safety Glass." J. Wilson. 2 p.m. Burlington House, London.

Jan. 8.—Institute of Fuel. "The Dedusting of Coal." G. Lindley. 6 p.m. Burlington House, Piccadilly, London.

Jan. 9.—Institute of Vitreous Enamellers. "Spraying Apparatus for Vitreous Enamelling." J. D. Whiteman. 8 p.m. British Industries House, Marble Arch, London.

Jan. 9.—Institute of Metals (London Section). "Metals of the Platinum Group." R. H. Atkinson. 7.30 p.m. 83 Pall Mall, London.

Jan. 10.—Chemical Engineering Group. "The Handling and Use of Liquid Chlorine." F. Holt. Burlington House, Piccadilly, London.

BELFAST.

Jan. 6.—Institute of Chemistry (Belfast Section). "Chemical Aspects of Nerve Transmission." Dr. H. Barcroft. 7.30 p.m. Physics Lecture Theatre of the Royal Belfast Academical Institution.

BIRMINGHAM.

Jan. 7.—Electrodepositors' Technical Society. Joint meeting with the Birmingham, Coventry and West Midlands Branch of the Institute of British Foundrymen. "Troubles Experienced in Electrodeposition due to Unsuitable Castings." B. Caplan. 7.30 p.m. James Watt Memorial Institute, Gt. Charles Street, Birmingham.

BRISTOL.

Jan. 9.—Society of Chemical Industry (Bristol Section). "Fused Silica—its Recent Developments and Applications." Dr. G. E. Stephenson. 7.30 p.m. University, Woodland Road, Bristol.

LIVERPOOL.

Jan. 9.—Institute of Chemistry (Liverpool Section). "Looking Backwards." W. Buchanan Gray. 7.30 p.m. Constitutional Club, India Buildings, Water Street, Liverpool.

MANCHESTER.

Jan. 10.—Society of Chemical Industry, Institute of Chemistry, and the Chemical Society (Manchester Sections). "A Chemical Contribution to the Cancer Enigma." Professor J. W. Cook. 7 p.m. Engineers' Club, Albert Square, Manchester.

Jan. 10.—Oil and Colour Chemists' Association (Manchester Section). "Some Characteristics of Lithopone and other Zinc Sulphide Pigments." Dr. H. Mills. College of Technology, Manchester.

STOURBRIDGE.

Jan. 6.—Society of Glass Technology (Midlands Section). "The History of Optical Glass." W. H. S. Chance. 7.30 p.m. Talbot Hotel, Stourbridge.

Company News

International Carbonizing Co.—The report for the year to June 30 last shows a loss of £313, increasing the debit balance of £19,075 brought in to £19,388.

New Transvaal Chemical Co.—Final dividends are announced for the year ended June 30, 1935, of 3 per cent., less tax, on the cumulative first preference shares and of 4 per cent., less tax, on cumulative "A" preference shares.

Transparent Paper, Ltd.—The trading profits at £6,300 for the year to September 30 last compare with a loss of £1,980 in the previous twelve months. A transfer of £5,000 is made to depreciation, and £1,200 is written off development of new products. A balance of £4,908 is carried forward, against £6,432 brought in.

Egyptian Salt and Soda Co.—The report for the year ended August 31, 1935, states that the gross profits were £E90,915 and net profits £E54,500, to which is added the amount brought forward, £E2,513, making £E57,013. The dividend is again 2s. 3d. per share and £E2,412 is carried forward.

Branston Artificial Silk Co.—For the year to September 30, the report states that there was a loss for the eight months to September 30, 1935, amounting to £7,006, which is carried forward. The directors state they have not yet been successful in raising necessary finance to restart factory, and negotiations are proceeding to this end.

Cannon Iron Foundries.—The net profits to September 30 last amount to £66,413, but of this total a sum of £30,893 represents profits earned prior to the purchase agreement last March with a private undertaking of a similar name, and is not, therefore, available for dividend. This latter figure, after deducting the dividend of £7,012 payable on the vendors company's capital, is carried to capital reserve. After charging tax and preference dividend, the available balance is £23,396. It is proposed to pay an initial dividend of 7½ per cent., less tax, on the ordinary shares for the period March 20 to September 30 last. This absorbs £14,531, leaving £8,865 carried forward.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

Mortgages and Charges

(NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt as specified in the last available Annual Summary, is also given marked with an *—followed by the date of the Summary, but such total may have been reduced.)

AYRTON SAUNDERS AND CO., LTD., Liverpool, druggists' sundriesmen. (M., 4/1/36.) Reg. Dec. 20, £6,800 mort., to J. A. Bartlett, 30 North John Street, Liverpool, and another; charged on 30 to 42 Duke Street, Liverpool. *£83,800. Apr. 30, 1935.

BRITISH BEMBERG, LTD., London, E.C., mfrs. of artificial silk, etc. (M., 4/1/36.) Reg. Dec. 18. Trust Deed dated Dec. 17, 1935, securing £75,000 debs., present issue £35,000; general charge. *£472,600. July 12, 1935.

DURION, LTD., London, S.W., elec. chemical engrs., etc. (M., 4/1/36.) Reg. Dec. 20, series of £3,000 (not ex.) debs., present issue £500; gen. charge (not including certain plant, etc.).

ILLINGWORTH CARBONIZATION CO., LTD., Manchester. (M., 4/1/36.) Reg. Dec. 18, £2,084 and £634 debs., parts of £50,000 (not ex.) already reg. *£33,500. Dec. 28, 1934.

Satisfactions

BRITISH BEMBERG, LTD., London, E.C., mfrs. of artificial silk, etc. (M.S., 4/1/36.) Satisfaction reg. Dec. 18, of debs. reg. July 25, 1928, to the extent of £763,700 by cancellation of 5,274 debs. of £100 each (previously redeemed) and by reduction of the nominal amount of each of the outstanding 4,726 debs. by £50.

BRITISH ENKA ARTIFICIAL SILK CO., LTD., London, E.C. (M.S., 4/1/36.) Satisfaction reg. Dec. 21, of debs. reg. Oct. 8, 1925, to extent of £49,600.

County Court Judgments

(NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court Judgments against him.)

BEAUCAIRE LABORATORIES (firm), 14 America Square, E.C., manufacturing chemists. (C.C., 4/1/36.) £22 11s. 4d. Nov. 11.

WENBORN'S SCIENTIFIC SUPPLIES (firm), 1a Nelson Place, N.1, laboratories and scientific glassware instrument dlrs. (C.C., 4/1/36.) £20 9s. 7d. Nov. 13.

Companies Winding-up Voluntarily

BIDEFORD BLACK, LTD. (C.W.U.V., 4/1/36.) By reason of its liabilities, Dec. 12. Mr. I. M. Henderson, 20 Copthall Avenue, London, E.C.2, appointed liquidator.

Books Received

The Chemistry of Synthetic Resins, by Carleton Ellis. New York: Reinhold Publishing Corporation. London: Chapman & Hall, Ltd. Vols. I and II. Pp. 1,417. £4 17s. 6d.

Official Publications Received

Department of Scientific and Industrial Research. Report for the year 1934-35. London: H.M. Stationery Office. Pp. 185. 3s.